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OSD2002-2

PLED 20x2 Character Module Specifications

PLED 20x2 Character Module OSD2002-2 Specification

1. Features

1. *2 lines of 20 characters of 5x8 (dots)*
2. *Low power consumption*
3. *High contrast ratio and wide viewing angle*
4. *Compatible with LCD 20x2 type*
5. *Controller is compatible with HD44780*
6. *4-bits or 8-bit MPU interface*
7. *High speed MPU interface:2 MHz(VDD=5V)*
8. *80x8 bit Display RAM(80 characters max.)*

2. Absolute maximum ratings

Symbol	Parameter	Min	Typ	Max	Unit
VDD	Supply voltage for Logic	4.5	5.0	5.5	V
Topr	Operating temperature	-20	25	60	^oC
Tstg	Storage temperature	-30		70	^oC
Vbt	Brightness control voltage		3		V
Tsolder	Soldering Temperature	260 for 5 seconds			
Pd	Module power consumption @Vbt=3V VDD=5V	50	80	130	mW

Item	Operating		Storage	
	Min.	Max.	Min.	Max.
Ambient Temperature	-20^oC	60^oC	-30^oC	70^oC
Humidity	40^oC 90%RH		40^oC 90%RH	
Corrosive gas	Not Acceptable		Not Acceptable	

3 Electrical Characteristics

3.1 DC Electrical Characteristics

(Ta= -20C to 50C)

Item	Symbol	Condition	Min	Typ	Max	Unit
Power supply voltage	VDD		4.5		5.5	V
Brightness control voltage	VBT			3		V
Power supply current	Icc	VDD=5V, (Logical only)		0.35	0.6	mA
High level input voltage	Vih		0.7VDD		VDD	V
Low level input voltage	Vil		-0.3		0.55	V
Leakage current	Il		-1		1	uA

3.2 AC Electrical Characteristics

(Ta= -20C to 50C)

Write operation

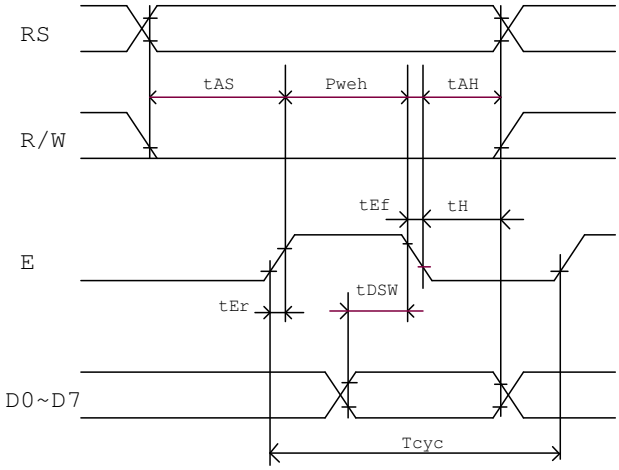
Item	Symbol	Min	Typ	Max	Unit
Enable Cycle Time	Tcyc	500			ns
Enable Pulse Width (High level)	Pweh	230			ns
Enable Rise/ Fall Time	tEf, tEr			20	ns
Address Set-up Time	tAS	40			ns
Address Hold Time	tAH	10			ns
Data Set-up Time	tDSW	80			ns
Data Hold Time	tH	10			ns

Read operation

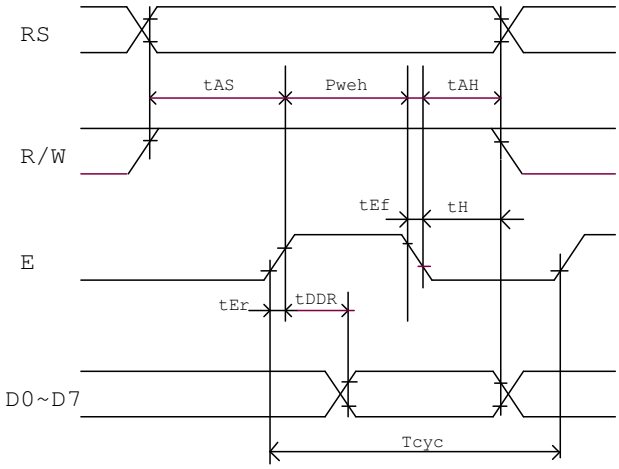
Item	Symbol	Min	Typ	Max	Unit
Enable Cycle Time	Tcyc	500			ns
Enable Pulse Width (High level)	Pweh	230			ns
Enable Rise/ Fall Time	tEf, tEr			20	ns
Address Set-up Time	tAS	40			ns
Address Hold Time	tAH	10			ns
Data Delay Time	tDDR			160	ns
Data Hold Time	tH	5			ns

3.3 Timing Chart

Write operation



Read operation



3.4 Display Data RAM (DDRAM)

The Display Data RAM (DDRAM) is used to store the Display Data that is represented as 8-bit character code. The Display Data RAM supports an extended capacity of 80 x 8-bits or 80 characters.

DDRAM	00	01	02	03	04	05	……	22	23	24	25	26	27
Address (Hex)	40	41	42	43	44	45	……	62	63	64	65	66	67

To illustrate, for 2-line x 20 characters display, the relationship between the DDRAM address and position of the PLED panel is shown below.

Display Position	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
DDRAM	00	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E	0F	10	11	12	13
Address	40	41	42	43	44	45	46	47	48	49	4A	4B	4C	4D	4E	4F	50	51	52	53

For shift left

DDRAM	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E	0F	10	11	12	13	14
Address	41	42	43	44	45	46	47	48	49	4A	4B	4C	4D	4E	4F	50	51	52	53	54

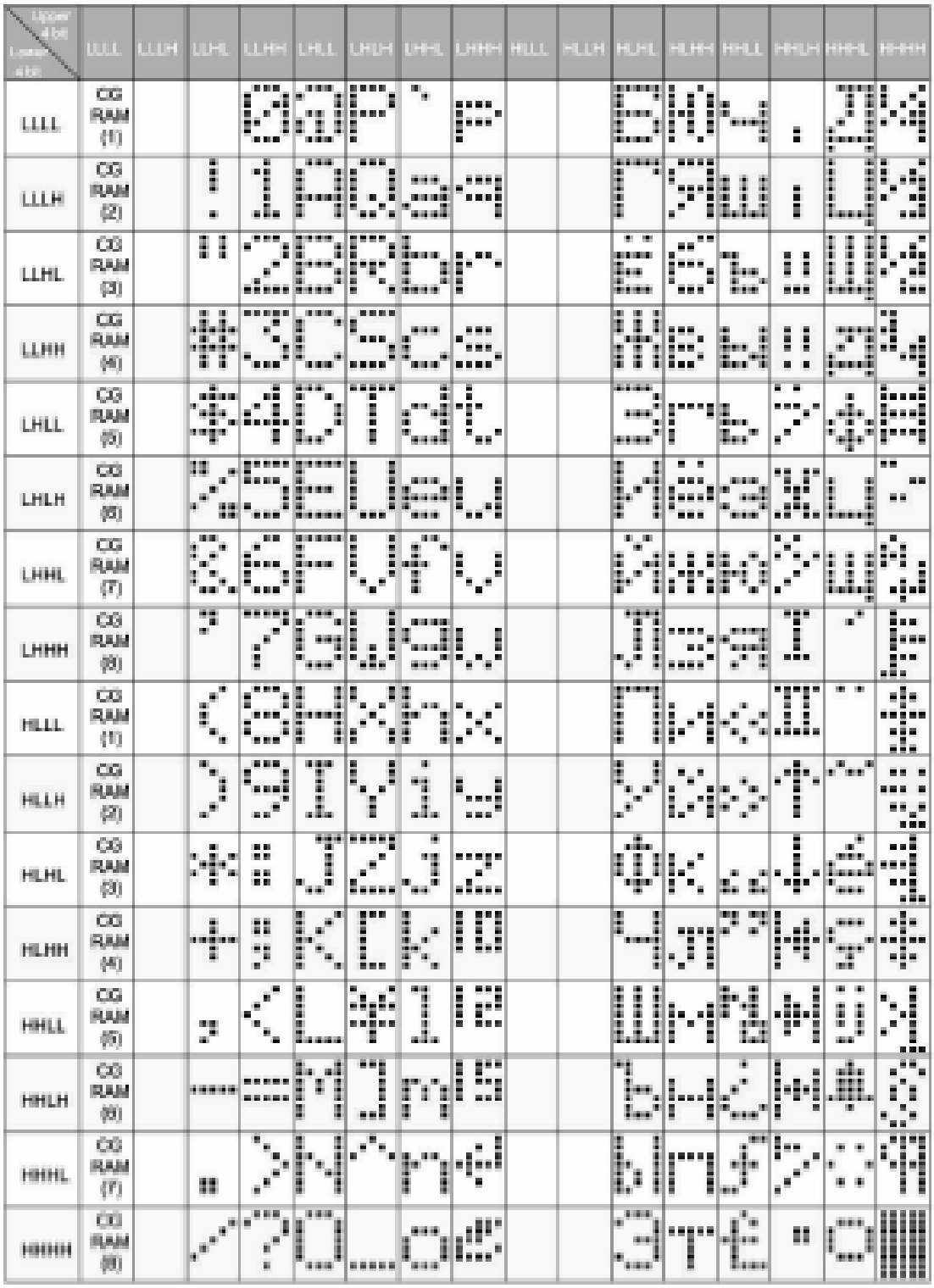
For shift right

DDRAM	27	00	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E	0F	50	51	52
Address	67	40	41	42	43	44	45	46	47	48	49	4A	4B	4C	4D	4E	50	51	52	53

3.5 Correspondence between character codes and char patterns

Standard Font Table

Optional Cyrillic Font Table



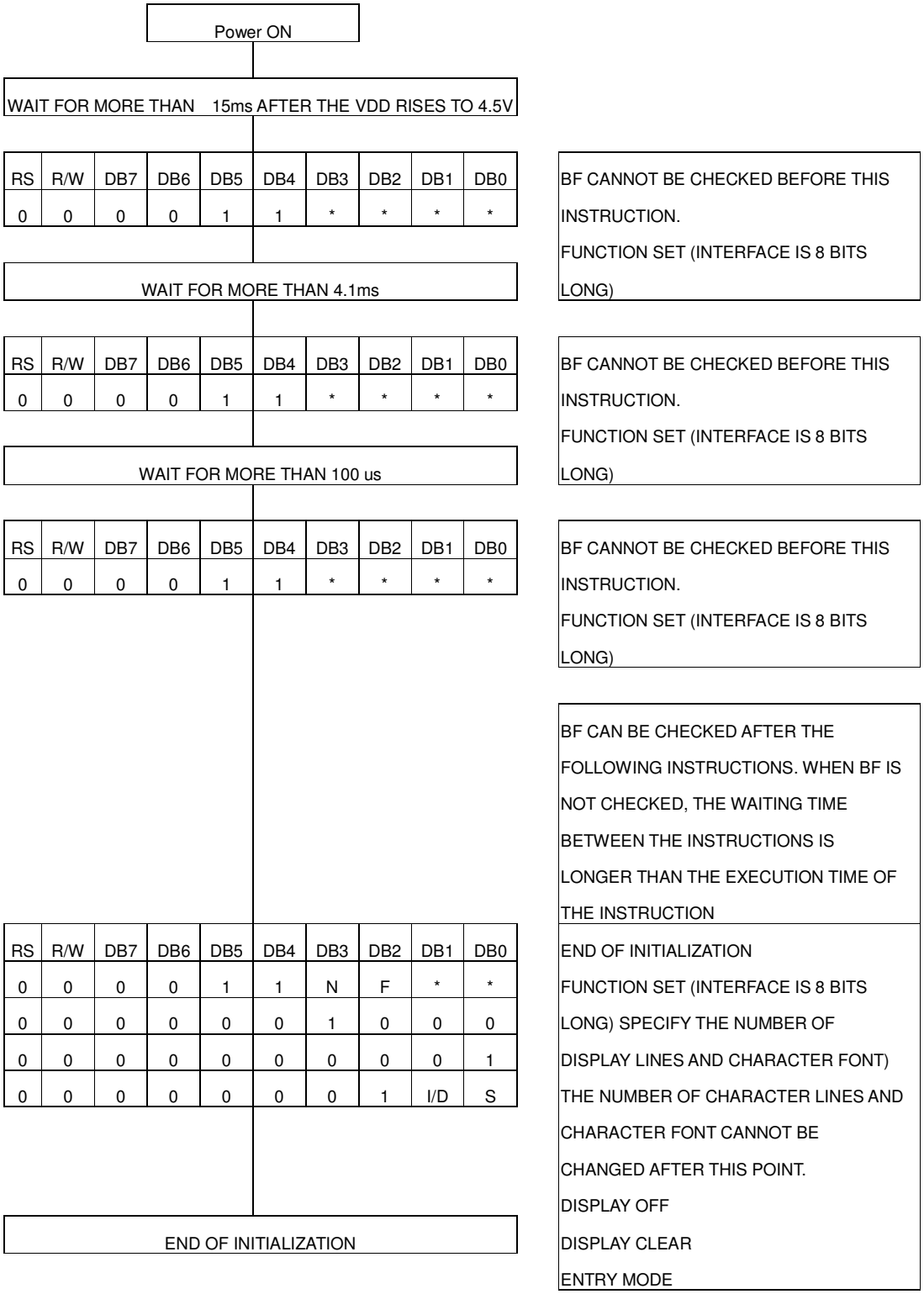
3.6 Instruction set

Instruction	Code										Description	Execution time
	RS	R/W	D7	D6	D5	D4	D3	D2	D1	D0		
Clear Display	0	0	0	0	0	0	0	0	0	1	Clear entire display. Sets DDRAM address 0 into address counter	1.52ms
Entry mode set	0	0	0	0	0	0	0	1	I/D	S	Sets cursor move direction and specifies display shift	37us
Display On/Off control	0	0	0	0	0	0	1	D	C	B	Sets entire display (D) On/Off Sets cursor (C) On/Off Sets Blinking (B) of cursor position character	37us
Cursor/display shift	0	0	0	0	0	1	S/C	R/L	X	X	Moves cursor & shifts display without changing DDRAM contents	37us
Function set	0	0	0	0	1	DL	N	F	X	X	Sets interface data length (DL) Sets number of display lines (N) Sets character font (F)	37us
Set CGRAM address	0	0	0	1	ACG	ACG	ACG	ACG	ACG	ACG	Sets CGRAM address. CGRAM data is sent and received after this setting.	37us
Set DDRAM address	0	0	1	ADD	ADD	ADD	ADD	ADD	ADD	ADD	Sets DDRAM address. The DDRAM data bus sent and received after this setting	37us
Read busy flag & address	0	1	BF	AC	AC	AC	AC	AC	AC	AC	Reads busy flag (BF) indicating that internal operation is being performed Reads address counter contents	0us
Write data into the CGRAM or DDRAM	1	0	Write data								Write data into the CGRAM or DDRAM	37us
Read data into the CGRAM or DDRAM	1	1	Read data								Read data from the CGRAM or DDRAM	37us
	I/D =1: Increment I/F=0:Decrement S =1: Display shift on D =1: Display on C =1: Cursor display on B =1: Cursor blink on S/C =1: Shift display S/C=0: Move cursor R/L =1: Shift right R/L=0:Shift left DL =1: 8-bit DL=0:4-bit N =1:Dual line N =0:Single line F =1:5x10 dots F =0:5x8 dots BF =1:Internal operation BF =0:Ready for instruction										DDRAM: Display Data RAM CGRAM: Character Generator RAM ACG: Character Generator RAM Address ADD: Display Data RAM Address AC: Address Counter	

3.7 Initialization via Instruction

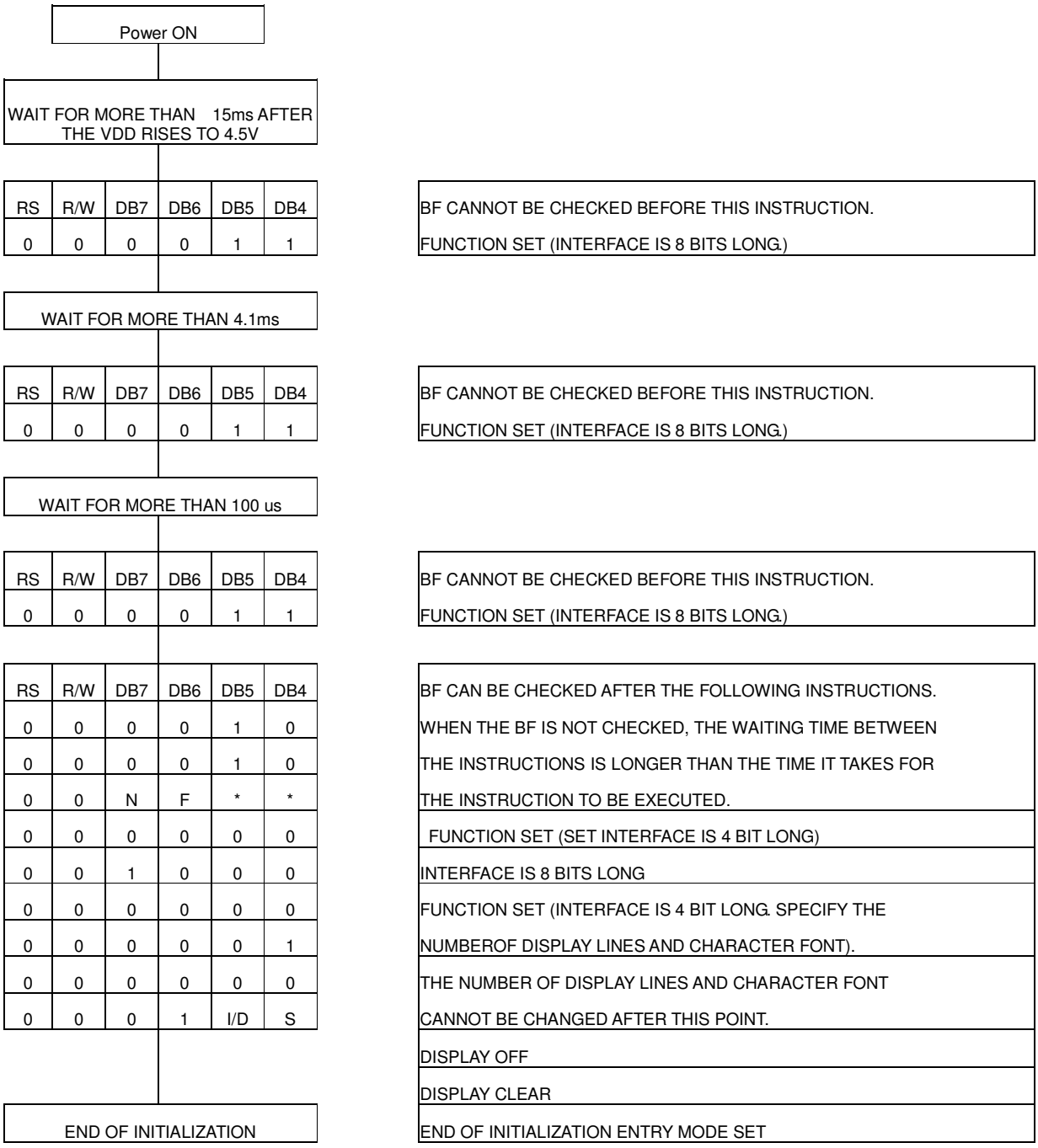
8-BIT INTERFACE

The following procedures are followed during the initialization of an 8-bit MPU

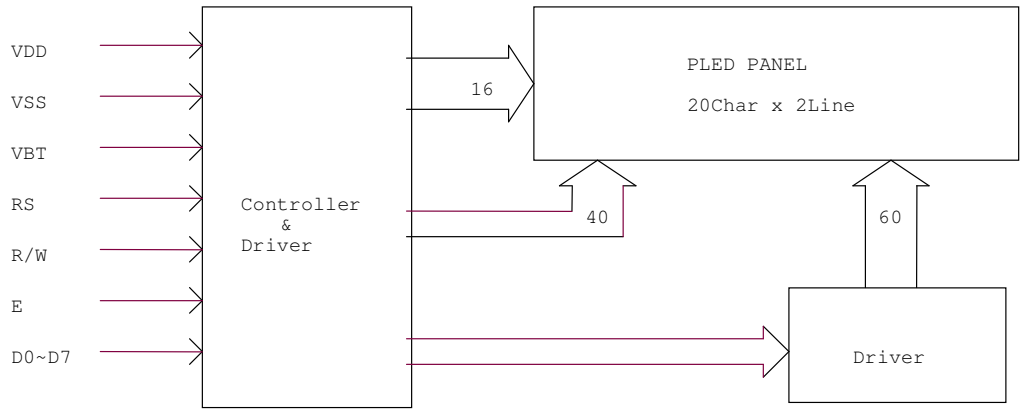


4-BIT INTERFACE

The following procedures are followed during the initialization of a 4-bit MPU



3.8 Block Diagram



4 Interface Pin Function

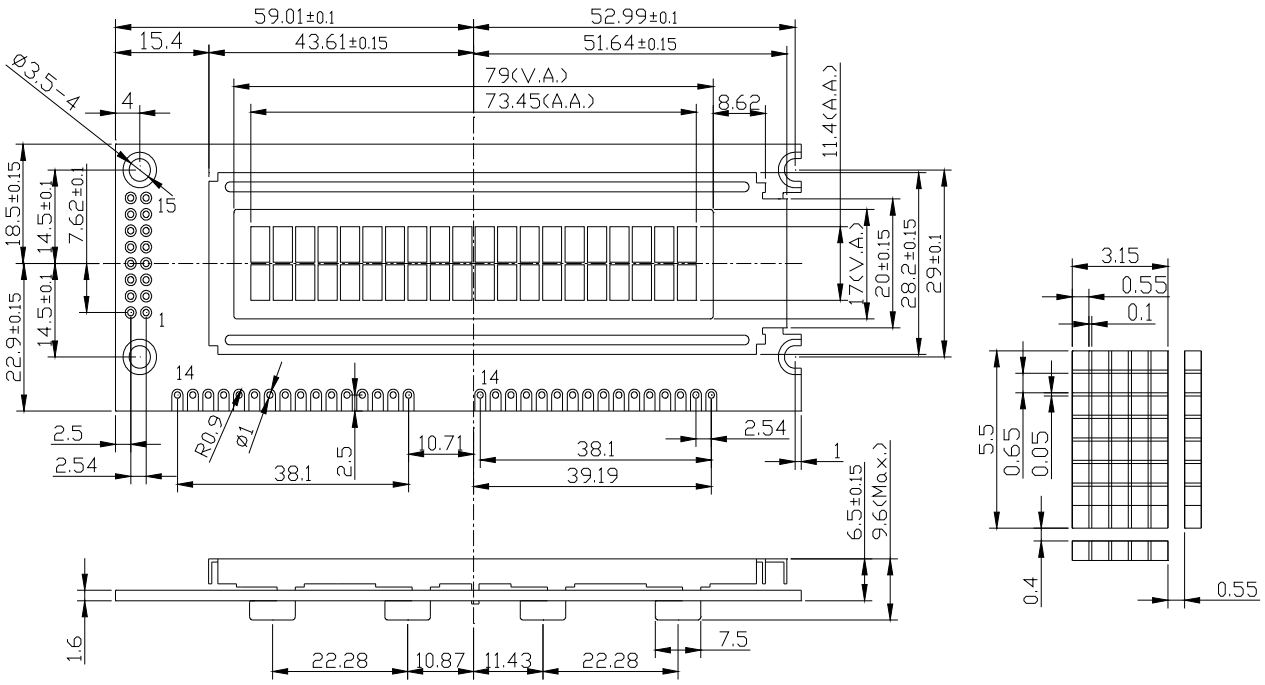
Pin No.	Symbol	I/O	Function
1	VSS	I	Ground
2	VDD	I	Power supply for logic
3	VBT	I	Brightness adjustment
4	RS	I	H: Data L: Instruction code
5	R/W	I	H: Read L: Write
6	E	I	H→L: Enable
7	D0	I	Data bus
8	D1	I	
9	D2	I	
10	D3	I	
11	D4	I	
12	D5	I	
13	D6	I	
14	D7	I	

6 Physical specifications

6.1 Mechanical specifications

NO.	Item	Specification	Unit
1	Active display area	73.45x11.4	mm
2	Viewing area	79.0x17.0	mm
3	Module dimension	113.0x41.4x9.6	mm
4	Dot size	0.5x0.65	mm
5	Weight	34	g

6.2 Drawing



7 Optical specifications

Item		Condition	Min.	Typ.	Max.	Unit
Response time	Rise		-	-	10	us
	Fall		-	-	10	us
Contrast ratio		100 lux	100	-	-	
Viewing angle	Top		-	80	-	deg
	Bottom		-	80	-	deg
	Left		-	80	-	deg
	right		-	80	-	deg
Brightness		With polarizer	30	40	50	nits
Color			-	YG[1]	-	

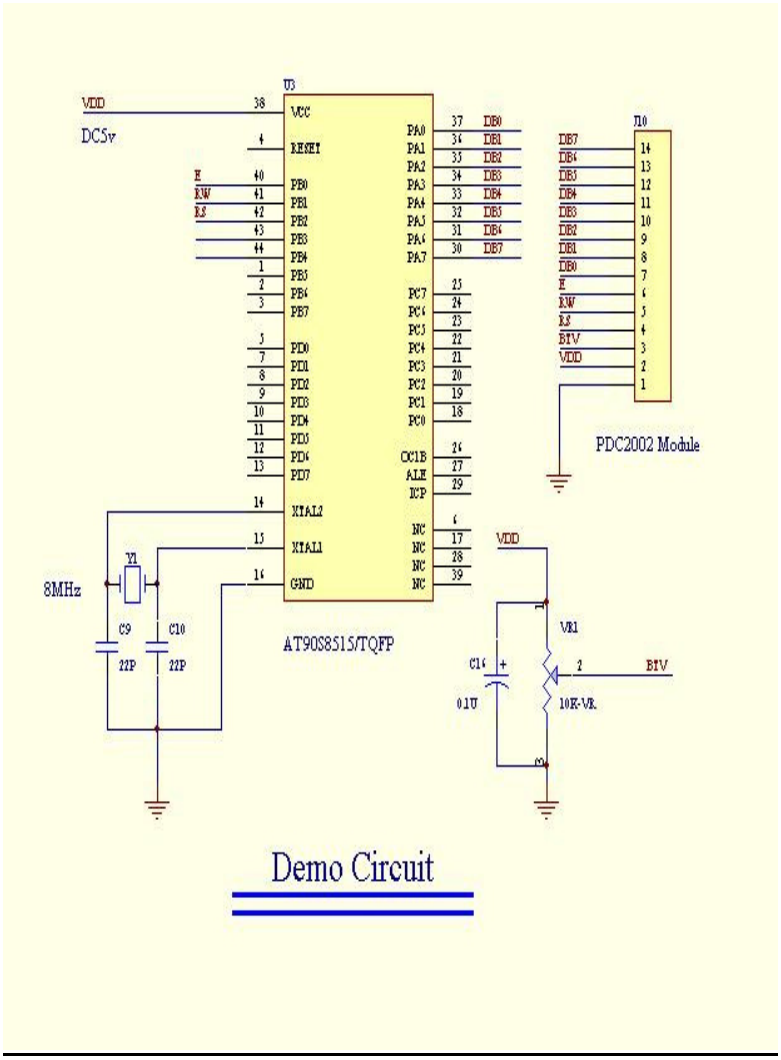
Note 1. YG.= yellow green

8 Reliability test items

NO.	***Test items***	***Conditions***
1	*High temperature storage*	*70°C , 240 hrs*
2	*Low temperature storage*	*-30°C,240 hrs*
3	*High temperature operation*	*60°C,240 hrs*
4	*Low temperature operation*	*-20°C, 240 hrs*
5	*High temperature and high humidity storage test*	*40°C, 90% RH, 240 hrs*
6	*Thermal shock test*	*-20°C → 60°C ， 20 cycles*

9 Application Note

(1) Ref. Circuit



(2) Ref. Programming

```
'-------------------------------------------------------------------------------
'It is an OSD2002-2 pattern program and shows A,B,C….on module.
'Here use BASCOM-AVR compile.
'-------------------------------------------------------------------------------
' Project name    :   20x2 character module
' file name       :   demo2002.bas
' MCU             :   AVR AT90S8515
' Xtal            :   8MHz
' Panel I/F       :     RS, RW, Enable, BTV
' Writer          :     Cheng-Nan Yeh
' Date            :     Dec.26, 2002    rev:A
'-------------------------------------------------
' DB0=PA0: DB1=PA1: DB2=PA2: DB3=PA3
' DB4=PA4: DB5=PA5: DB6=PA6: DB7=PA7
' RS=PB2: RW=PB1: Enable=PB0
'-------------------------------------------------
'-------------initial setting
$regfile = "8515DEF.DAT"
Config Porta = Output
Config Portb = Output
Dim J As Integer , Cara As Byte    , I As Byte
Dim Command_diable As Byte, Command_enable As Byte
Dim Command_write_data As Byte , Command_clear_display As Byte
Dim Command_move_right As Byte , Command_display_on As Byte
Dim Command_line2_char5x7 As Byte , Command_ddram_&H00 As Byte
Dim Command_ddram_&H40 As Byte , Write_char As Byte
'---------
Command_diable = &H00
Command_enable = &H01
Command_clear_display = &H01
Command_move_right = &H1D
Command_display_on = &H0C
Command_line2_char5x7 = &H38
Command_ddram_&H00 = &H80
Command_ddram_&H40 = &HC0
Command_write_data = &H05
Write_char = &H40
'---------
C = 1
I = 0
'-------------clear module display and cursor back home
Portb = Command_enable                          'RS=0, RW=0, Enable=1
Porta = Command_clear_display
Waitus 500                                      'wait 500uS for MCU internal delay time
Portb = Command_diable                          'You need to set PB0=0 after PB0=1 for MCU.
'-------------setting S/C, R/L, I/D, S
Portb = Command_enable
Porta = Command_move_right                      'S/C=1 ,R/L=1 ,I/D=0, S=1
Waitus 500
Portb = Command_diable
'--------------display on / off
Portb = Command_enable
Porta = Command_display_on                      'D=1, C=0, B=0
Waitus 500
Portb = Command_diable
'--------------setting 5x7 Char. 2-Line
Portb = Command_enable
Porta = Command_line2_char5x7                   'DL=1, N=1, F=0
Waitus 500
Portb = Command_diable
```

```
'-----------------------------------------------
''--------fill in any data to module
''--------------setting DDRAM address &H00
For J = 1 To 20 Step 1
Portb = Command_enable
Porta = Command_ddram_&H00 + I                    'set address is &H00
Waitms 10                                         '         and next one
Portb = Command_diable
'-------write data up
Portb = Command_write_data
Porta = Write_char + C                            'write Char. is "A" and next one.
Waitms 10
Portb = Command_diable
Cara = Cara + 1
'--------------setting DDRAM address &H40
Portb = Command_enable
Porta = Command_ddram_&H40 + I                    'set address is &H40
Waitms 10                                         '         and next one
Portb = Command_diable
'-------write data down
Portb = Command_write_data
Porta = Write_char + C                            'write Char. is "B" and next one.
Waitms 10
Portb = Command_diable
'---------
C = C + 1
I = I + 1
If I = 20 Then I = 0                              'if DDRAM address is end then come back &H00.
If C = 40 Then C = 0
Next J
'---------------end program
End
```

Download free BASCOM-AVR DEMO compiler from http://www.mcselec.com/

10 Precaution in Design

(1) Please do not put mechanical stress on the module. Mechanical stress will cause damage to the metal, plastic, and PLED panel.
(2) The polarizer is easily scratched and should be carefully handled. Please do not touch the polarizer with hard materials, such as tweezers, pencil lead and glass. Please do not touch it by.
(3) This module is easily damaged by static discharge, please be cautious of static electricity and insure human body grounding.
(4) The Half-Brightness Decay Life will be longer than 10K hours when the module is operated at room temp.