DISPLAY Elektronik GmbH

DATA SHEET

LCD MODULE

DEM 16223 FGH-PW

Product Specification ***Version: 2***

24/July/2009

GENERAL SPECIFICATION

MODULE NO. :

DEM 16223 FGH-PW

CUSTOMER P/N:

Version No.	Change Description	Date
0	Original Version	28.04.2009
1	Add Version	08.05.2009
2	Update PCB Description	24.07.2009

PREPARED BY: XYP DATE: 24.07.2009

APPROVED BY: MH DATE: 24.07.2009

CONTENTS

1. FUNCTIONS & FEATURES

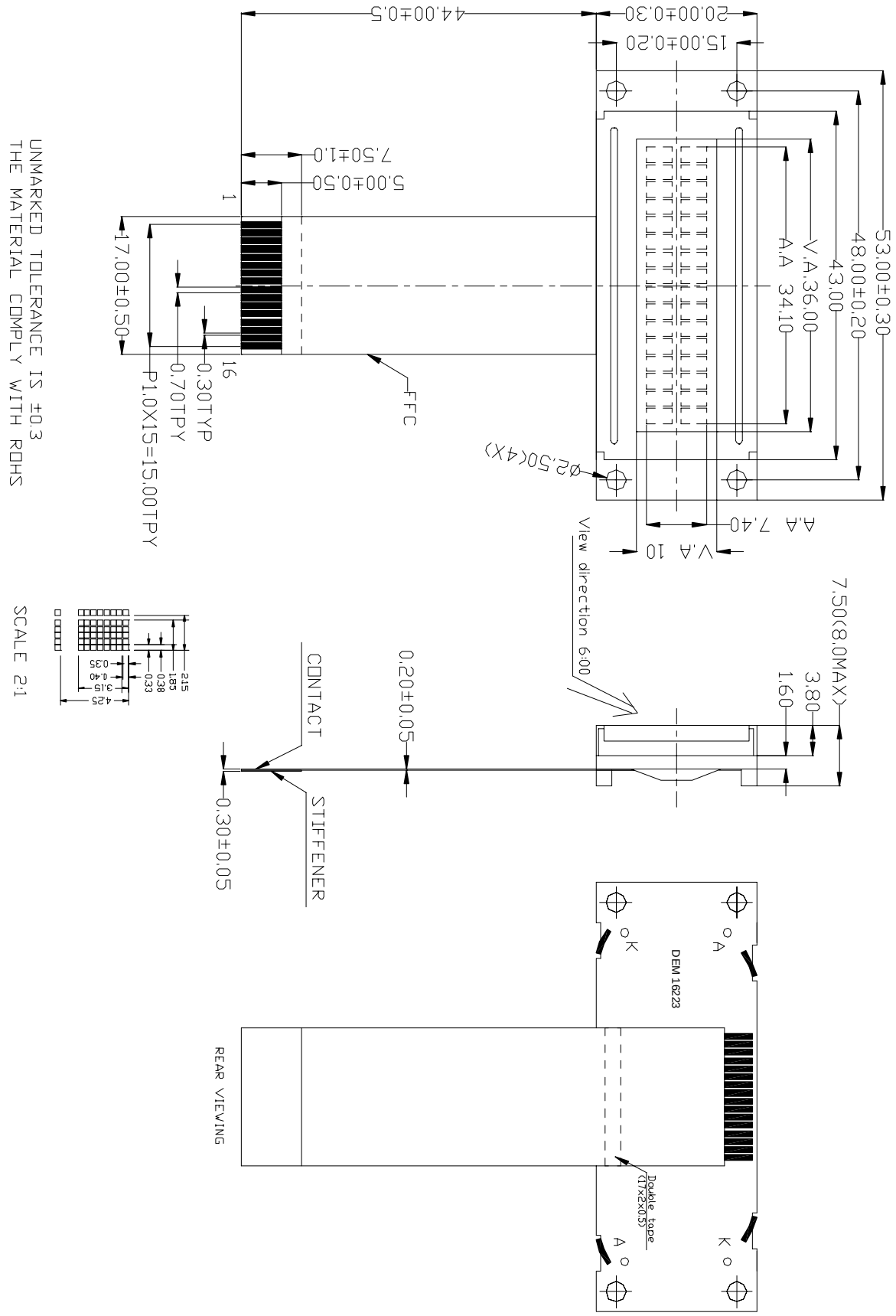
Module Name	LCD Type	Remark
DEM 16223 FGH-PW	FSTN Transflective Positive Mode	Pin15: K, Pin 16 : A

- Viewing Direction : 6 O'clock
- Driving Scheme : 1/16 Duty Cycle, 1/5 Bias
- Power Supply Voltage : 5.0 Volt (typ.)
- V_{LCD} Adjustable For Best Contrast : 4.5 Volt (typ.)
- Display contents : 16 x 2 Characters
- Internal Memory : CGROM (10,880 bits)
  : CGRAM (64 x 8 bits)
  : DDRAM (80 x 8 bits)
- CGROM : CGROM of the SPLC783A1-001B
- Interface : Easy Interface with a 4-bit or 8-bit MPU

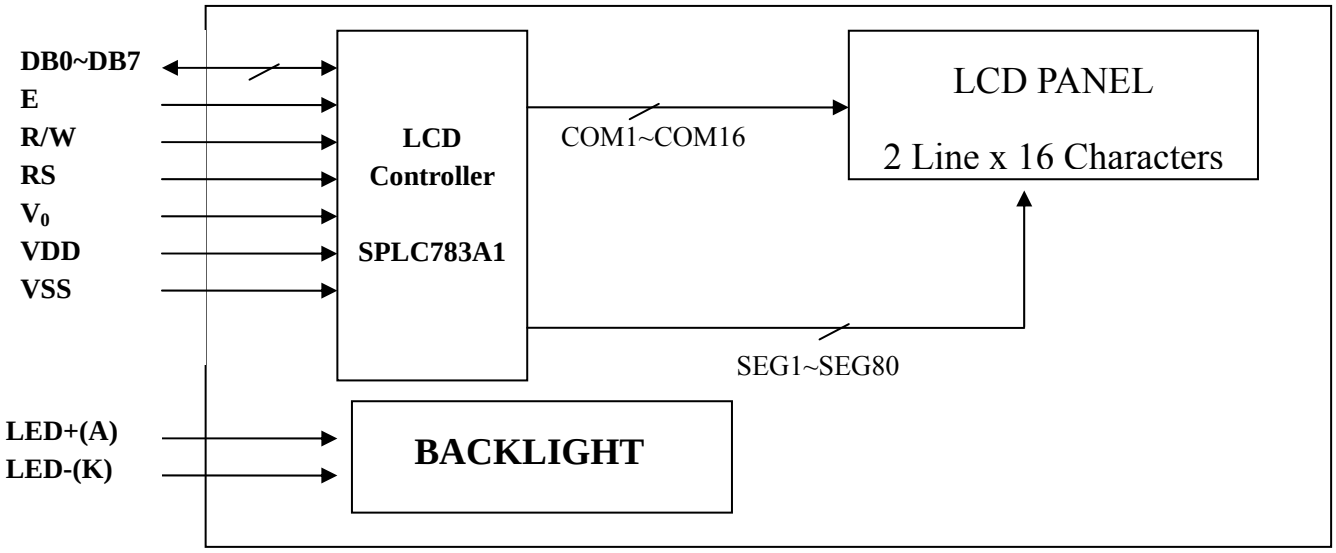
2. MECHANICAL SPECIFICATIONS

- Module Size : 53.00 x 20.00 x 7.50 mm
- Character Pitch : 2.15 x 4.25 mm
- Character Size : 1.85 x 3.15 mm
- Character Font : 5 x 8 dots
- Dot Size : 0.33 x 0.35 mm
- Dot Pitch : 0.38 x 0.40 mm
- Dot Gap : 0.05mm

3. EXTERNAL DIMENSION



4. BLOCK DIAGRAM

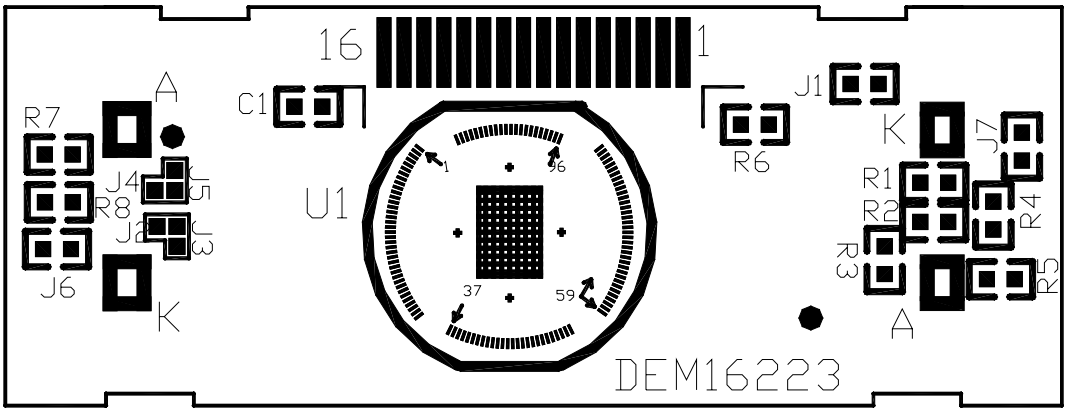


5. PIN ASSIGNMENT

Pin No.	Symbol	Function
1	VSS	Ground terminal of module.
2	VDD	Supply terminal of module 5.0V.
3	V0	Power Supply for liquid crystal drive.
4	RS	Register select RS = 0…Instruction register RS = 1…Data register
5	R/W	Read /Write R/W = 1…Read R/W = 0…Write
6	E	Enable
7	DB0	Bi-directional data bus, data transfer is performed once, thru DB0 to DB7, in the case of interface data. Length is 8-bits; and twice, thru DB4 to DB7 in the case of interface data length is 4-bits. Upper four bits first then lower four bits.
8	DB1	
9	DB2	
10	DB3	
11	DB4	
12	DB5	
13	DB6	
14	DB7	
15	LED – (K)	Please also refer to 6.1 PCB drawing and description.
16	LED + (A)	Please also refer to 6.1 PCB drawing and description.

6. PCB DRAWING AND DESCRIPTION

6.1 PCB DRAWING



DESCRIPTION:

6-1-1.The polarity of the pin 15 and the pin 16:

J3,J5	J2, J4	LED Polarity	
		15 Pin	16 Pin
Each open	Each closed	Anode	Cathode
Each closed	Each open	Cathode	Anode

Note: In application module: J3=J5=closed, J2=J4= open [DEM 16223 FGH-PW]

6-1-2. The metal-bezel is set on ground when the J1 is closed.

Note: In application module: J1=closed

6-1-3.The LED resistor can be bridged when the J6 is closed.

Note: In application module: J6=open

6-1-4.The R7 and the R8 is the LED resistor.

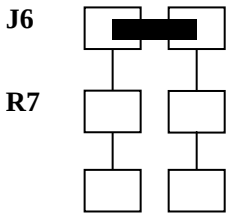
Note: R8=open, R7=82Ω

6-1-5 The Mounting holes are set on ground when the J7 is closed.

Note: In application module: J7 is closed.

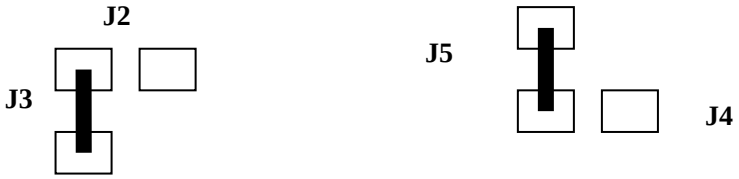
6.2 Example application

6-2-1. The LED resistor should be bridged as following.



6-2-2. The 15 pin is the anode and the 16 pin is the cathode as following.

6-2-3.The 15 pin is the cathode and the 16 pin is the anode as following.



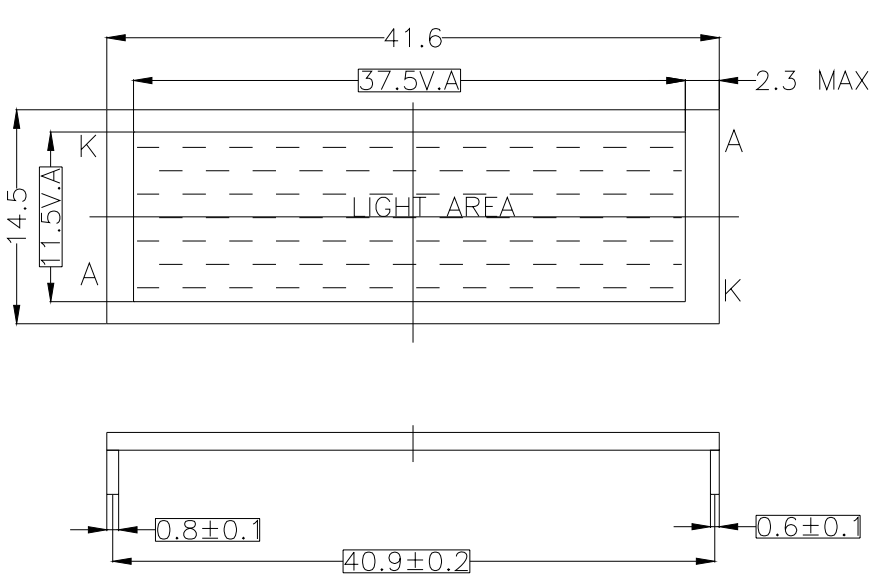
6-2-4. The metal-bezel is on ground as follows.

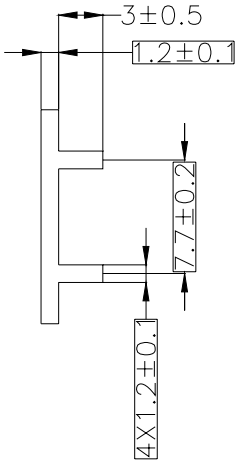
6-2-5. The Mounting holes are set on ground as follows.

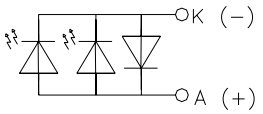
7. BACKLIGHT ELECTRICAL-OPTICAL CHARACTERISTICS

ELECTRICAL–OPTICAL CHARACTERISTICS

Item	Symbol	min.	typ.	max.	Unit	Condition
Forward Voltage	Vf	2.8	3.2	3.4	V	If= 40 mA
Power Dissipation	Pd	–	–	136	mW	If= 40 mA
Luminous Uniformity	ΔLv	70			%	MIN/MAX*100%
Luminance	Lv		300		cd/m^2	If= 40 mA T=25°C
Color Coordinate	X	0.250		0.330		
	Y	0.250		0.330		







REMARKS:
1.UNMARKED TOLERANCE IS ±0.3,
2.THE MATERIAL COMPLY WITH ROHS.
3.COLOR:WHITE

8. DISPLAY DATA RAM (DDRAM)

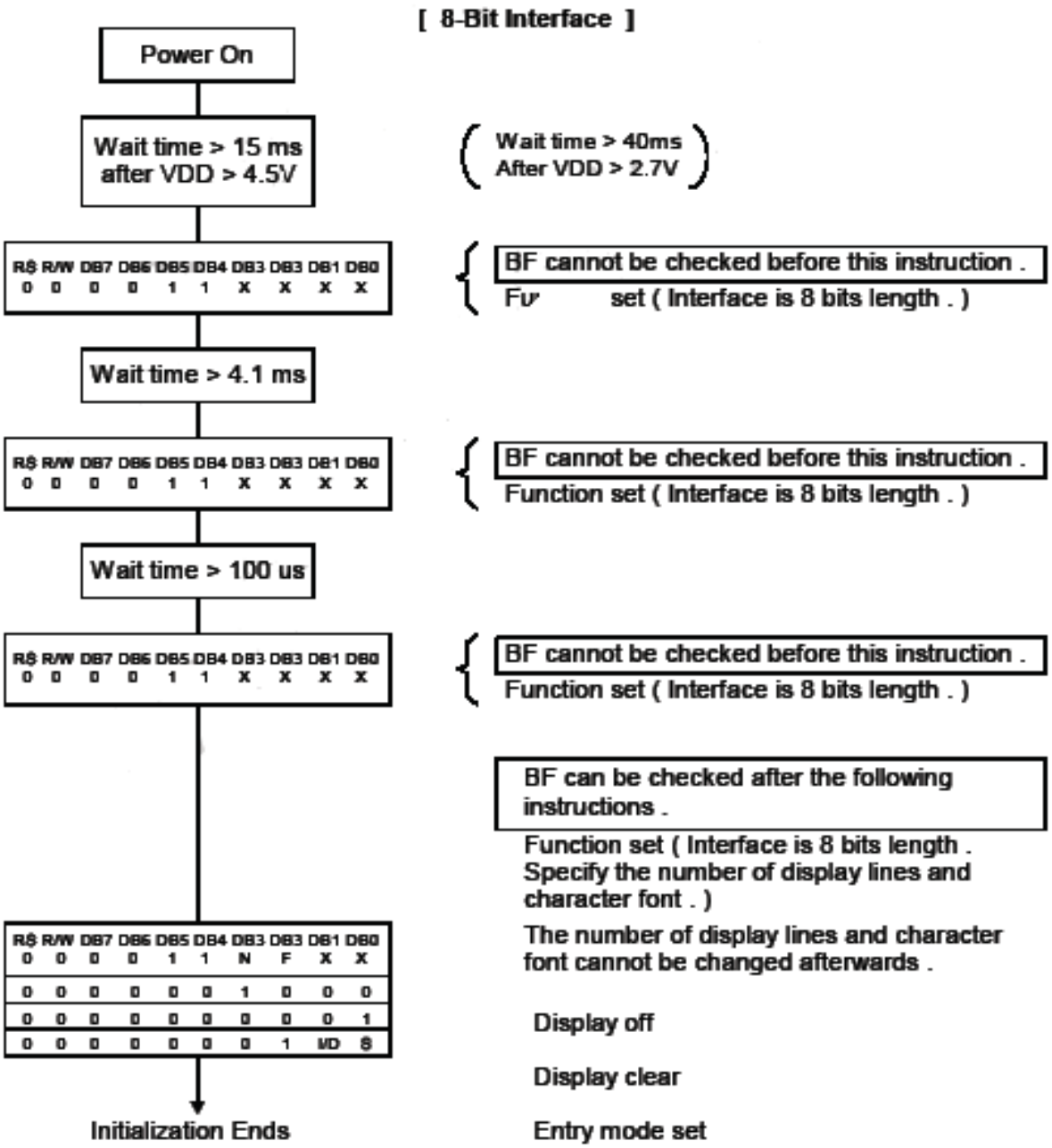
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	← DISPLAY POSITION
FIRST LINE	00	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E	0F	← DDRAM ADDRESS
SECOND LINE	40	41	42	43	44	45	46	47	48	49	4A	4B	4C	4D	4E	4F	

9. INSTRUCTION DESCRIPTION

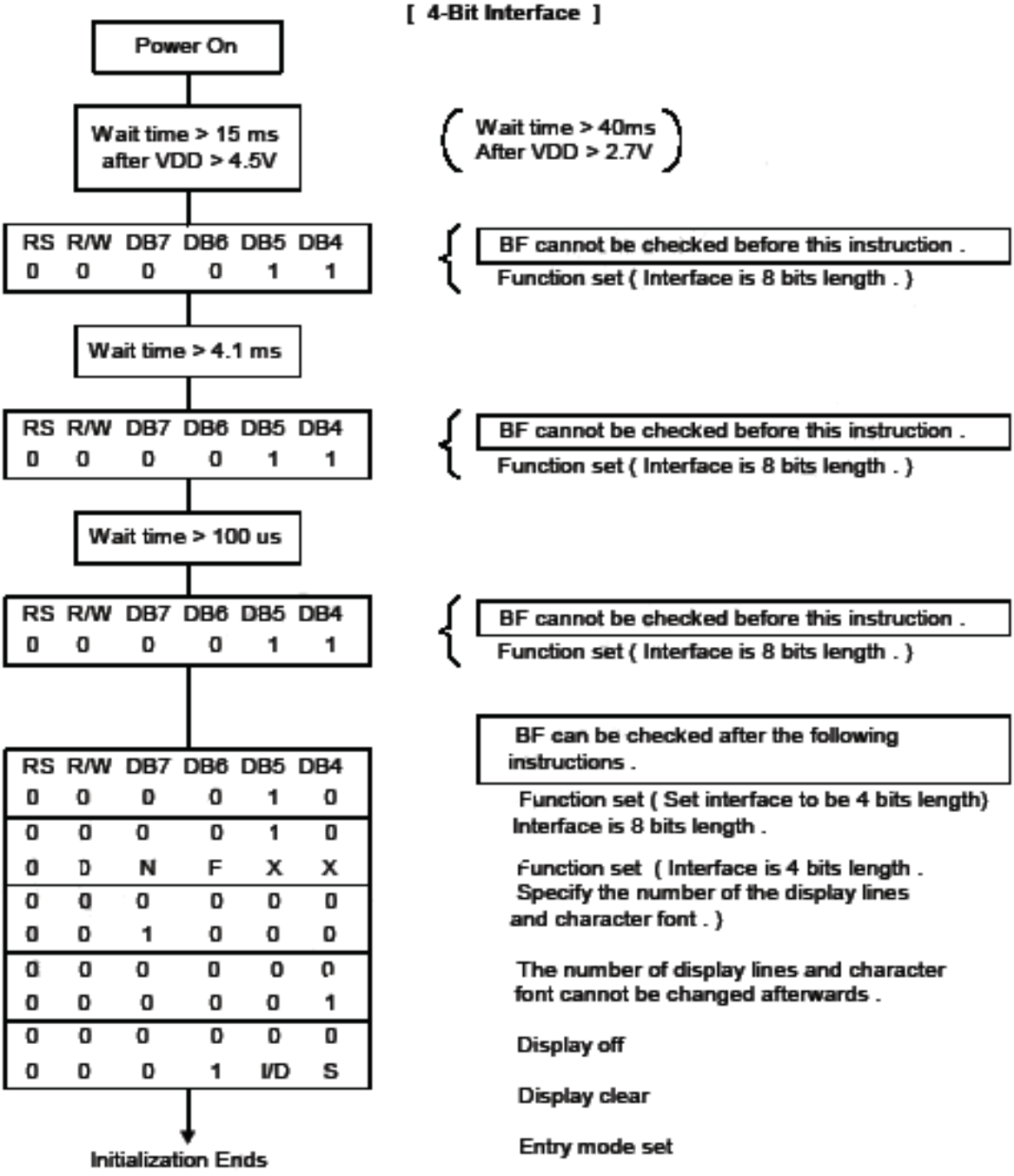
Instruction	Instruction Code										Description	Execution time (fosc= 270kHz)
	RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0		
Clear Display	0	0	0	0	0	0	0	0	0	1	Write “20H” to DDRAM and set DDRAM address to “00H” from AC.	1.52 ms
Return Home	0	0	0	0	0	0	0	0	1	-	Set DDRAM address to “00H”from AC and return 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	1	I/D	S	Assign cursor moving direction and enable the shift of entire display.	38us
Display ON/OFF Control	0	0	0	0	0	0	1	D	C	B	Set display (D), cursor(C), and blinking of cursor (B) on/off control bit.	38us
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.	38us
Function set	0	0	0	0	1	DL	N	F	-	-	Set interface data length (DL:4-bit/8-bit), numbers of display line (N:1-line/2-line, display font type (F: 5×10 dots/5×8 dots)	38us
Set CGRAM address	0	0	0	1	AC5	AC4	AC3	AC2	AC1	AC0	Set CGRAM address in address counter.	38us
Set DDRAM address	0	0	1	AC6	AC5	AC4	AC3	AC2	AC1	AC0	Set DDRAM address in address counter.	38us
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.	0us
Write data to RAM	1	0	D7	D6	D5	D4	D3	D2	D1	D0	Write data into internal RAM (DDRAM/CGRAM).	38us
Read data to RAM	1	1	D7	D6	D5	D4	D3	D2	D1	D0	Read data into internal RAM (DDRAM/CGRAM).	38us

NOTE: “-”don’t care

10. INITIALIZING BY INSTRUCTION



[4-Bit Interface]



11. MAXIMUM ABSOLUTE POWER RATINGS

Item	Symbol	Standard value	Unit
Power supply voltage(1)	V_{DD}	-0.3~+7.0	V
Power supply voltage(2)	V_{LCD}	V_{DD}-12.0~V_{DD}+0.3	V
Input voltage	V_{IN}	-0.3~V_{DD}+0.3	V
Operating temperature	Topr	-20~+70	°C
Storage temperature	Tstg	-25~+75	°C

12. ELECTRICAL CHARACTERISTICS

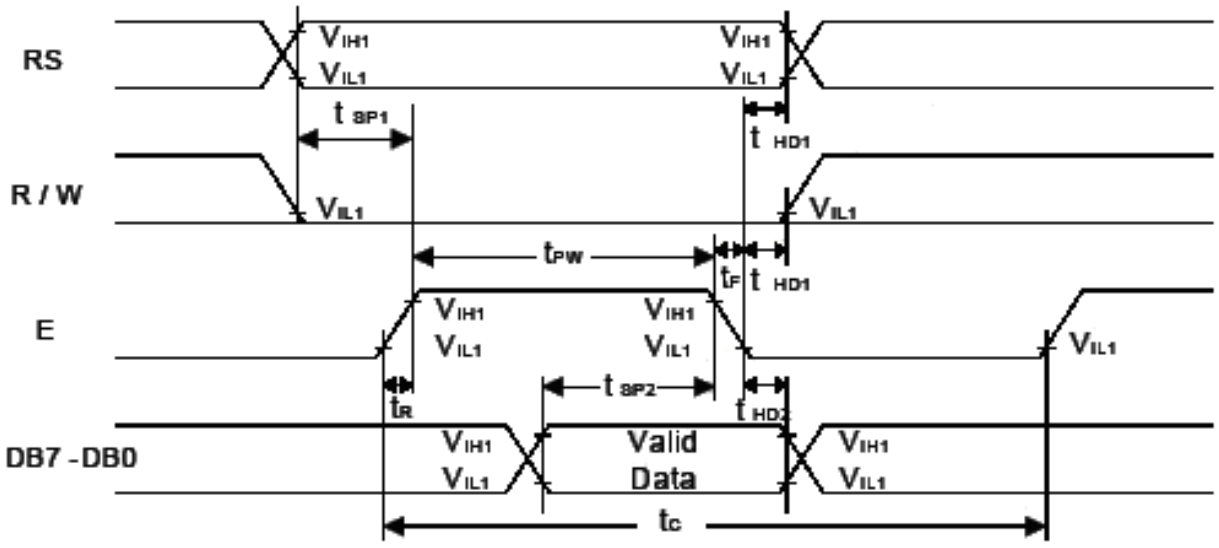
12-1 DC Characteristics

Item	Symbol	Standard Value			Test Condition	Unit
		MIN	TYP	MAX		
Operating Voltage	V_{DD}	4.7	5	5.3	-------	V
LCD Driving Voltage	V_{LCD}	4.2	4.5	4.8	V_{DD}-V_0	V
Supply Current	I_{DD}	----	TBD	----	-------	mA

12-2 AC Characteristics

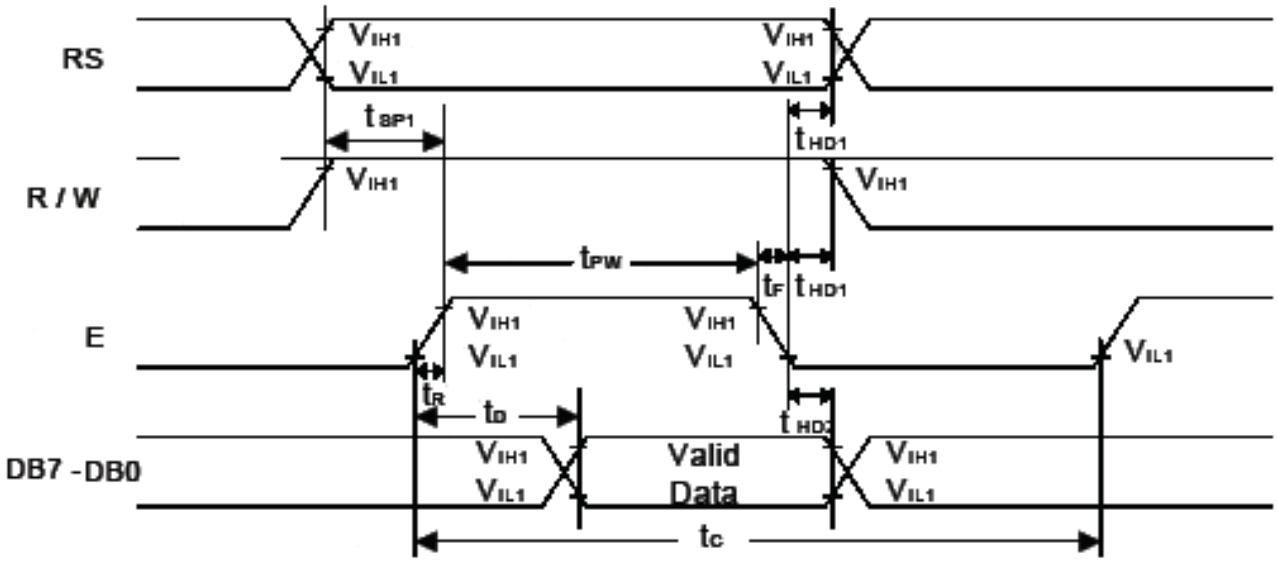
12-2-1 Write mode (writing data from MPU to SPLC783A1)

Characteristics	Symbol	Limit			Unit	Test Condition
		Min.	Typ.	Max.		
E Cycle Time	t_C	500	-	-	ns	Pin E
E Pulse Width	t_{PW}	220	-	-	ns	Pin E
E Rise/Fall Time	t_R, t_F	-	-	25	ns	Pin E
Address Setup Time	t_{SP1}	40	-	-	ns	Pins: RS, R/W, E
Address Hold Time	t_{HD1}	10	-	-	ns	Pins: RS, R/W, E
Data Setup Time	t_{SP2}	60	-	-	ns	Pins: DB0 - DB7
Data Hold Time	t_{HD2}	10	-	-	ns	Pins: DB0 - DB7

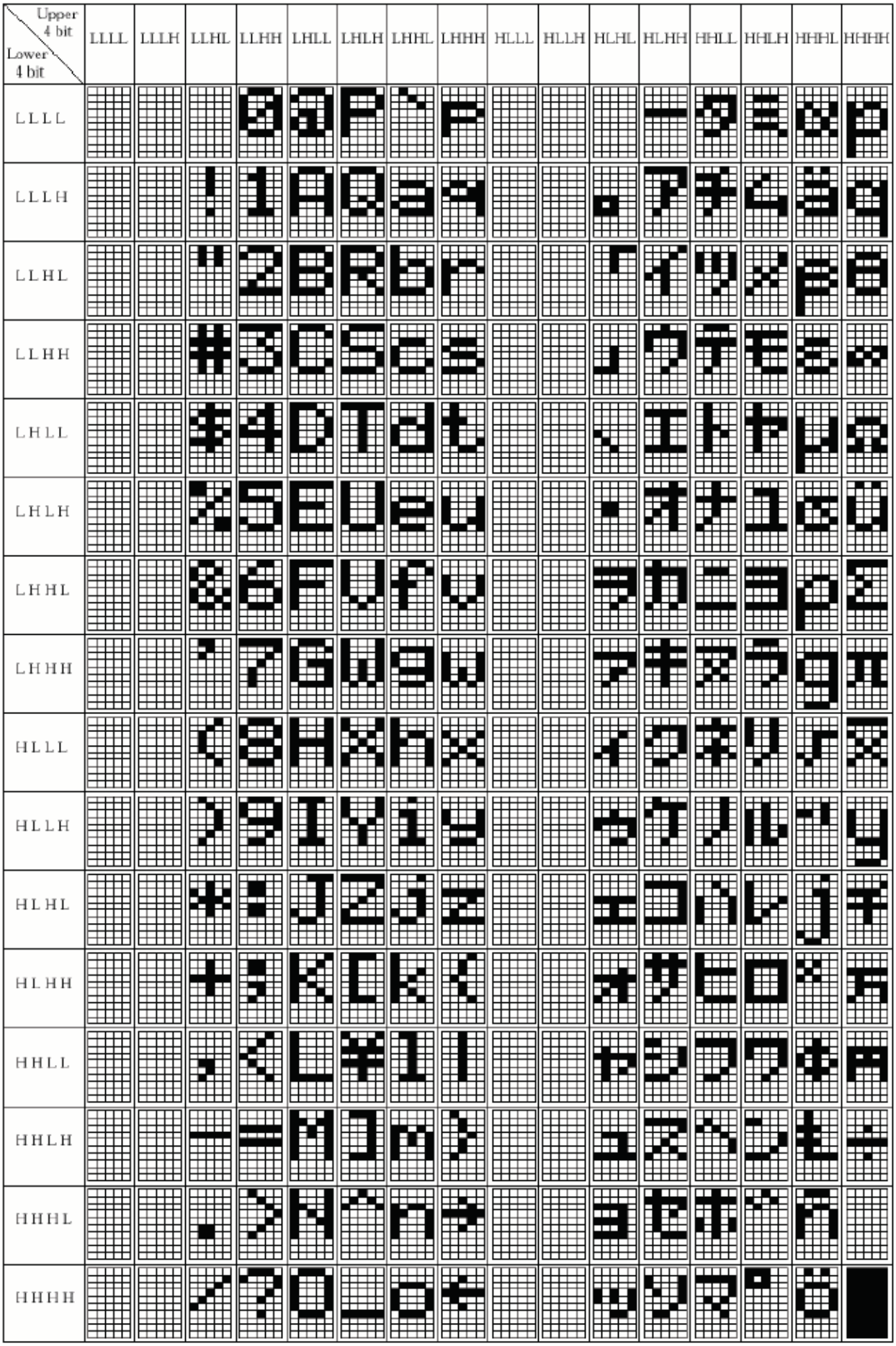


12-2-2 Read mode (Reading data from SPLC783A1 to MPU)

Characteristics	Symbol	Limit			Unit	Test Condition
		Min.	Typ.	Max.		
E Cycle Time	t_C	500	-	-	ns	Pin E
E Pulse Width	t_W	220	-	-	ns	Pin E
E Rise/Fall Time	t_R, t_F	-	-	25	ns	Pin E
Address Setup Time	t_{SP1}	40	-	-	ns	Pins: RS, R/W, E
Address Hold Time	t_{HD1}	10	-	-	ns	Pins: RS, R/W, E
Data Output Delay Time	t_D		-	120	ns	Pins: DB0 - DB7
Data Hold Time	t_{HD2}	20	-	-	ns	Pins: DB0 - DB7



13. CHARACTER GENERATOR ROM



14. LCD MODULES HANDLING PRECAUTIONS

- Please remove the protection foil of polarizer before using.
- The display panel is made of glass. Do not subject it to a mechanical shock by dropping it from a high place, etc.

- If the display panel is damaged and the liquid crystal substance inside it leaks out, do not get any in your mouth. If the substance come into contact with your skin or clothes promptly wash it off using soap and water.

- Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary.

- The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarize carefully.

- To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.
  -Be sure to ground the body when handling the LCD module.
  -Tools required for assembly, such as soldering irons, must be properly grounded.
  -To reduce the amount of static electricity generated, do not conduct assembly and other work under dry conditions.
  -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.

- Storage precautions
  When storing the LCD modules, avoid exposure to direct sunlight or to the light of fluorescent lamps. Keep the modules in bags designed to prevent static electricity charging under low temperature / normal humidity conditions (avoid high temperature / high humidity and low temperatures below 0°C).Whenever possible, the LCD modules should be stored in the same conditions in which they were shipped from our company.

15. OTHERS

- Liquid crystals solidify at low temperature (below the storage temperature range) leading to defective orientation of liquid crystal or the generation of air bubbles (black or white). Air bubbles may also be generated if the module is subjected to a strong shock at a low temperature.

- If the LCD modules have been operating for a long time showing the same display patterns may remain on the screen as ghost images and a slight contrast irregularity may also appear. Abnormal operating status can be resumed to be normal condition by suspending use for some time. It should be noted that this phenomena does not adversely affect performance reliability.

- To minimize the performance degradation of the LCD modules resulting from 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.