
Product Specification

Part Name: Monochrome LCD Character Module

Element Touch Part ID:

TLEC0802F1 (FSTN with White LED B/L)

Ver: B



Revision History

Rev.	Date	Contents	Written	Approved
A	2015/12/23	Preliminary Specification	He	Zhang
B	2016/06/21	Change Big AA LCD	He	Zhang

Special Notes

Note1.	

1. FUNCTIONS & FEATURES

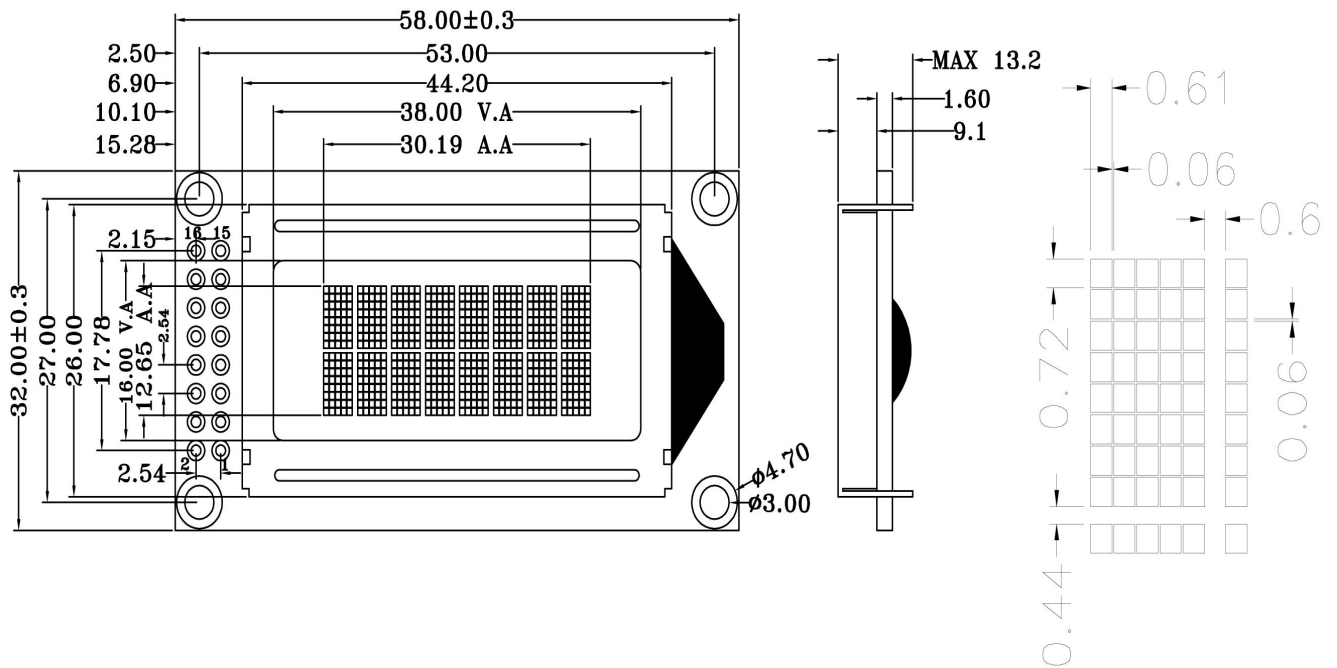
Features

- Characters: 8×2 Lines
- LCD Mode: FSTN
- Controller IC: RW1063-0A-001 or Equivalent
- Driving Method: 1/16 Duty; 1/5 Bias
- Viewing Angle: 6 O'clock direction
- 6800 serial 8-Bit/4-Bit MPU Interface/4-SPI/IIC
- Backlight: WHITE LED
- Operating Temperature Range: -20 to 70°C ;
- Storage Temperature Range : -30 to 80°C ;

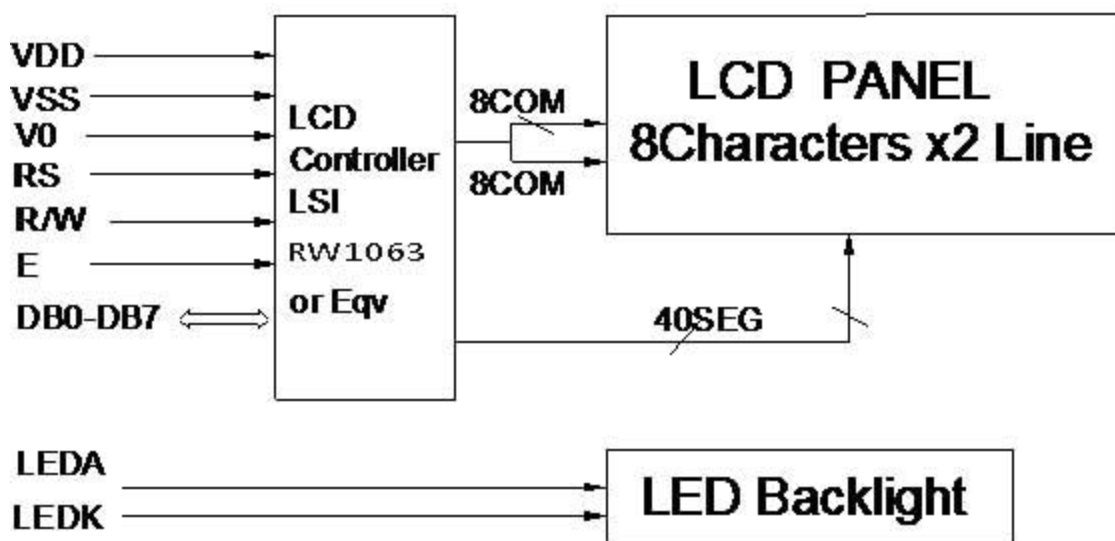
2. MECHANICAL SPECIFICATIONS

ITEM	SPECIFICATIONS	UNIT
Module Size	$58.0\text{L} \times 32.0\text{W} \times 13.2 \text{ (max) H}$	mm
View Area	38.0×16.0	mm
Number of Character	8×2 Lines	—
Character Size	3.25×6.09	mm
Character Pitch	3.85×6.53	mm

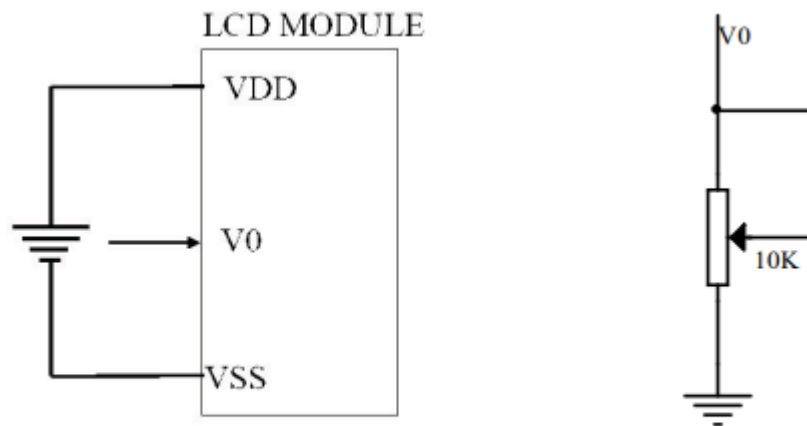
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5. POWER SUPPLY



VDD-V0=Operating voltage for LCD

6. PIN DESCRIPTION

6800/8080

ITEM	SYMBOL	LEVEL	FUNCTION
1	VSS	0V	Power Ground
2	VDD	5.0V	Power Supply For Logic
3	V0	-	Contrast Adjust
4	RS	H/L	H: Data L: Command
5	R/W	H/L	H: Read L: Write
6	E	H, H->L	Enable Signal
7 ~ 10	DB0 ~ DB3	H/L	Low 4-bit Data Bus
11 ~ 14	DB4 ~ DB7	H/L	High 4-bit Data Bus
15	LEDA	5.0V	Power Supply For LED Backlight
16	LEDK	0V	

4 SPI:

ITEM	SYMBOL	LEVEL	FUNCTION
1	VSS	0V	Power Ground
2	VDD	5.0V	Power Supply For Logic
3	V0	-	Contrast Adjust
4	RS	H/L	H: Data L: Command
5	NC	-	No connect
6	NC	-	No connect
7 ~ 11	NC ~ NC	-	No connect
12	CSB(DB5)	L	Chip selection input, must be connect to VSS
13	SCLK(DB6)	H/L	Serial clock input
14	SID(DB7)	H/L	Serial input data
15	LEDA	5.0V	Power Supply For LED Backlight
16	LEDK	0V	

IIC:

ITEM	SYMBOL	LEVEL	FUNCTION
1	VSS	0V	Power Ground
2	VDD	5.0V	Power Supply For Logic
3	V0	-	Contrast Adjust
4	RS	H/L	H: Data L: Command
5	NC	-	No connect
6	NC	-	No connect
7	SA0(DB0)	-	Slave address, must be connect to VDD or VSS
8	SA1(DB1)	-	Slave address, must be connect to VDD or VSS
9 ~ 11	NC ~ NC	-	No connect
12	CSB(DB5)	L	Chip selection input
13	SDA(DB6)	H/L	Serial input data
14	SCLK(DB7)	H/L	Serial clock input
15	LEDA	5.0V	Power Supply For LED Backlight
16	LEDK	0V	

7. MAXIMUM ABSOLUTE LIMIT (T=25°C)

Items	Symbol	Min	Max	Unit	Condition
Supply Voltage	Vdd	0	5.0	V	Vss=0V
Input Voltage	Vin	0	Vdd	V	Vss=0V
Operating Temperature	Top	-20	70	°C	No Condensation
Storage Temperature	Tst	-30	80	°C	No Condensation

Note: Voltage greater than above may damage the module

All voltages are specified relative to Vss=0V

8. ELECTRICAL CHARACTERISTICS

8.1 DC Characteristics (VDD=+5V, VSS=0V, Ta=-0~+50° C)

Items	Symbol	Min	TYP	Max	Unit	Condition
Operating Voltage	Vdd	4.7V	5.0	5.3	V	Vdd
Supply Current	Idd	—	1.5	3.5	mA	except LED backlight
Input High Voltage	Vin	$0.8 \times Vdd$	—	Vdd	V	RS,RW,E,DB0-DB7
Input Low Voltage	Vil	Vss	—	0.5	V	
Output High Voltage	Voh	$0.7 \times Vdd$	—	Vdd	V	Ioh=-0.1mA,DB0-DB7
Output Low Voltage	Vol	Vss	—	0.5	V	Iol=0.1mA,DB0-DB7
LCD Driving Voltage	Vlcd	4.6	4.8	5.0	V	Vdd-V0

8.2 AC Characteristics (VDD=+5V, VSS=0V, TTa=-20~75°)

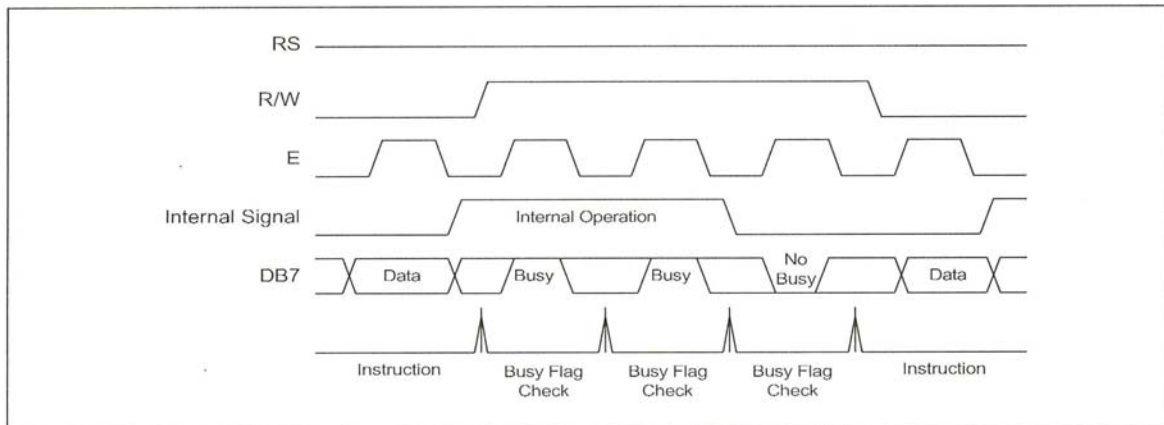
Items	Symbol	Min	TYP	Max	Unit
E cycle time	tc	1500	—	—	nS
E high level width	tpw	175	—	—	nS
E rise time	tr	—	—	20	nS
E fall time	tf	—	—	20	nS
Address set-up time	tas	5	—	—	nS
Address hold time	tah	13	—	—	nS
Data set-up time	tdsw	50	—	—	nS
Data delay time	tddr	—	—	125	nS
Data hold time	th	13	—	—	nS

8.3 LED Backlight Characteristics(COLOR : WHIT, Ta=-25°C)

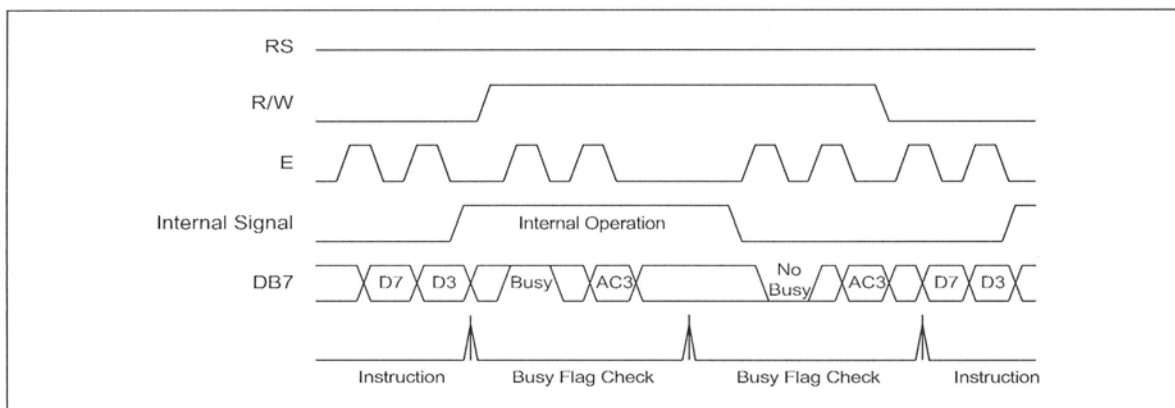
Items	Symbol	Condition	Min	TYP	Max	Unit
Backlight Supply Voltage	Vf		4.8	5.0	5.2	V
Backlight Supply Current	If	VLED=3.0V	-	15	20	mA
Power consumption	Pd	VLED=3.0V		100		mW
Life theory		VLED=3.0V,ILED=15mA		20000		H

MPU write timing

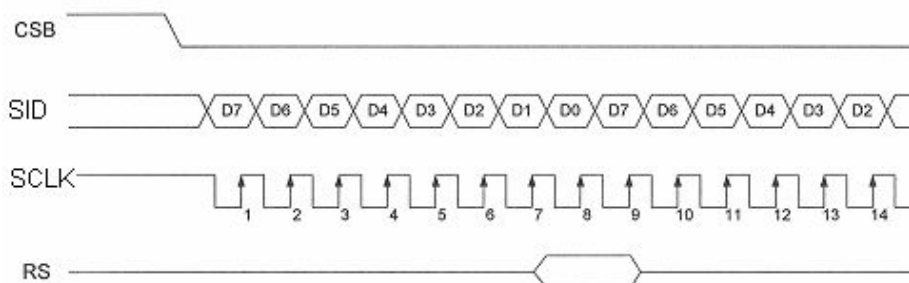
Interface with 8-bit MPU



Interface with 4-bit MPU



For serial interface data bus lines (DB5 to DB7) are used. 4-Line SPI



For serial interface data, bus lines (DB5(CSB), DB6(SDA) and DB7(SCL)) are used.

IIC interface

The IIC interface receives and executes the commands sent via the IIC Interface. It also receives RAM data and sends it to the RAM.

The IIC Interface is for bi-directional, two-line communication between different ICs or modules. Serial data line SDA (DB6) and a Serial clock line SCL (DB7) must be connected to a positive supply via a pull-up resistor.

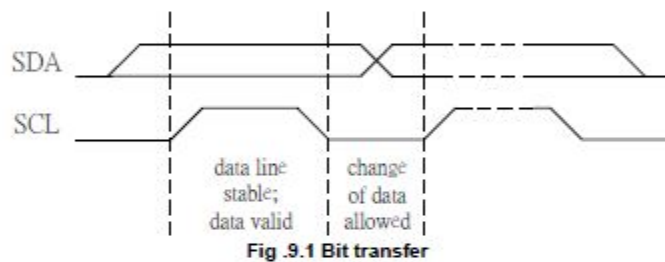
Data transfer may be initiated only when the bus is not busy.

*The CSB (DB5) Pin must be setting to "VSS".

* When IIC interface is selected, the DL register must be set to "1".

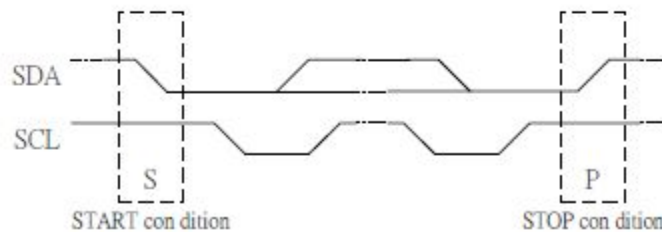
➤ BIT TRANSFER

One data bit is transferred during each clock pulse. The data on the SDA line must remain stable during the HIGH period of the clock pulse because changes in the data line at this time will be interpreted as a control signal. Bit transfer is illustrated in Fig.9.1

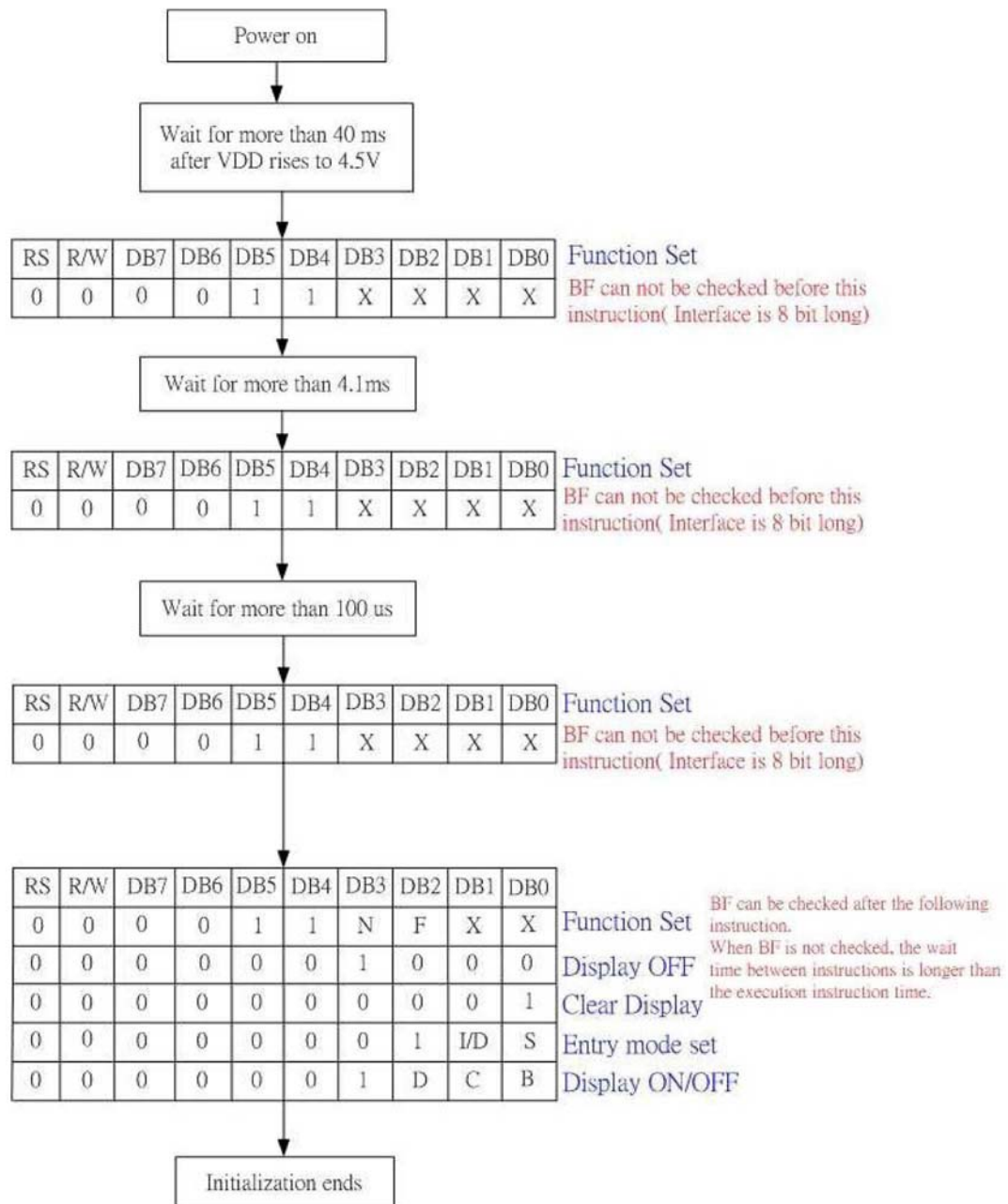


➤ START AND STOP CONDITIONS

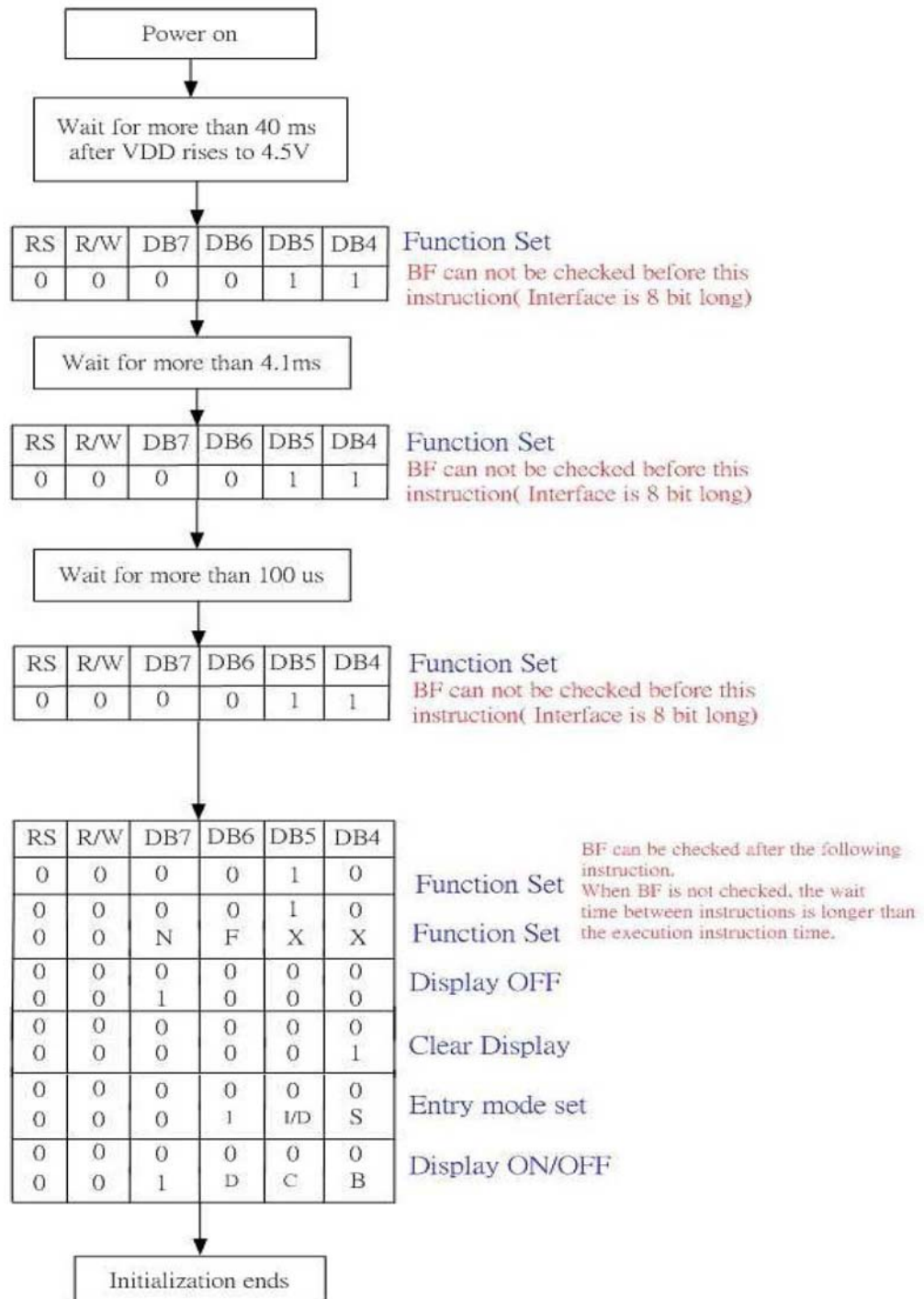
Both data and clock lines remain HIGH when the bus is not busy. A HIGH-to-LOW transition of the data line, while the clock is HIGH is defined as the START condition (S). A LOW-to-HIGH transition of the data line while the clock is HIGH is defined as the STOP condition (P). The START and STOP conditions are illustrated in Fig.9.2

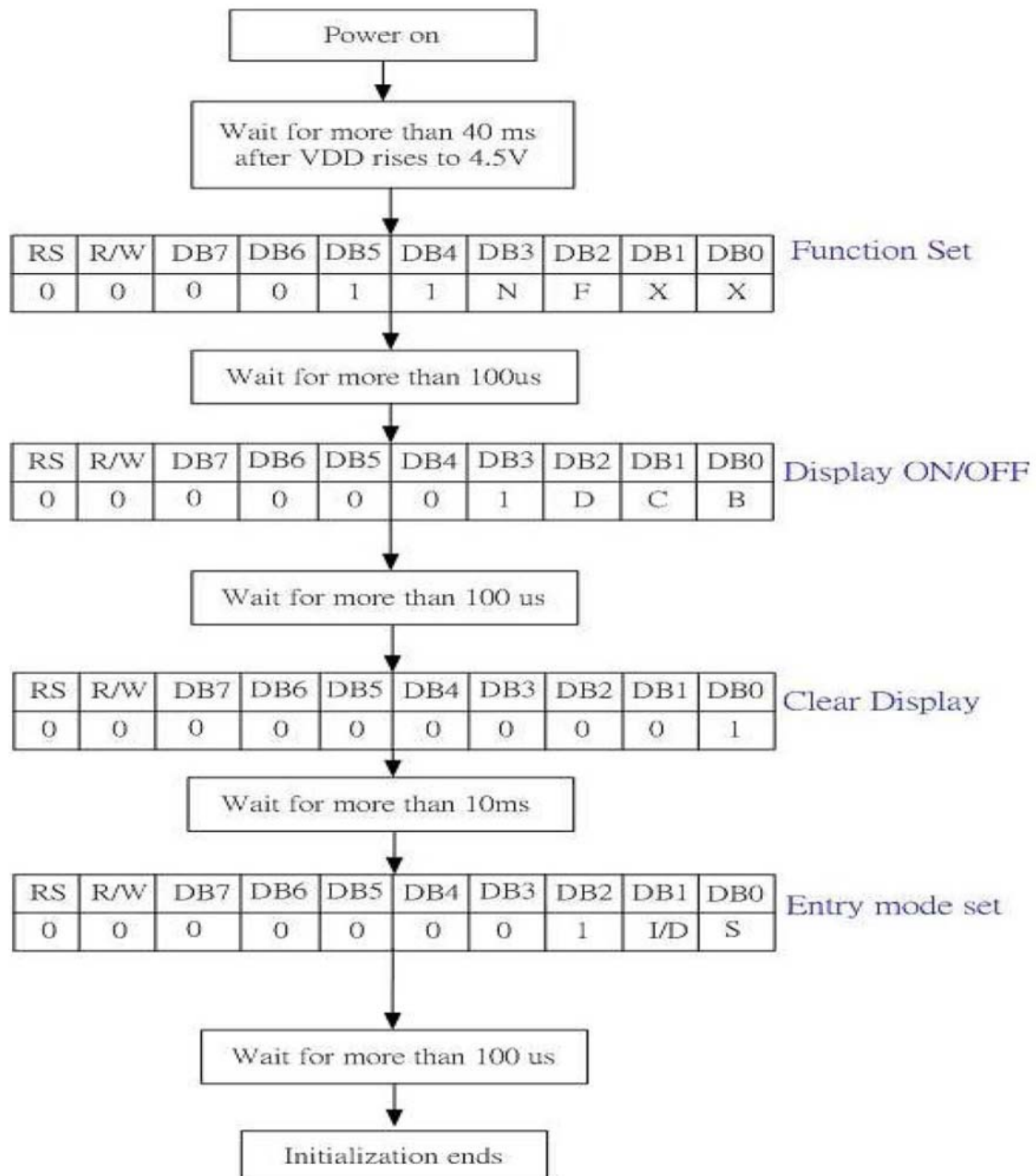


INITIALIZING BY INSTRUCTION

8 bit interface (Fosc=540KHz)

4 bit interface (Fosc=540KHz)



Serial Interface code (Fosc=540KHz)**9. FUNCTION SPECIFICATIONS**

To drive the LCD module correctly and provide normal display, please use the following setting:

- N=1, 2-line display
- F=0, 5×8 dots font

- D=1, display on

Note:

- These setting/commands should issue to the LCD module while start up.
- See the Display Commands section for details.

9.2. Resetting The LCD Module

When turning on the VDD and VSS power supply, LCD module will execute the reset routine automatically. It takes about 50ms. After the reset routine, the LCD module status will be as follow:

- N=1, 2-line display
- Display clear
- DL=1, 8-bit interface
- N=0, 1-line display
- F=0, 5×8 dot character font
- D=0, Display off
- C=0, Cursor off
- B=0, Blinking off
- I/D=1, Increment by 1
- S=0, No shift

NOTE:

- Reset routine could not generate the Basic Setting

9.3. Display Memory Map

There are two main memory-areas in the LCD module for display.

- Character Generator RAM(CGRAM)
- Display Data RAM(DDRAM)

9.3.1. Character Generator RAM(CGRAM)

Character Generator RAM is for storing the User-defined Characters(5×8 dots font). Totally 8 User-defined Characters(character code = 00h-07h) could be created.

The User-defined Character Codes are 00h and 07h. They could be called into DDRAM as normal character.

User-defined Character Code	CGRAM Address	CGRAM Data (Font Pattern)	
		D7 ~ D5	D4 ~ D0
00h (08h)	00h 01h . 06h 07h	Not Use	5 x 8 dots font pattern
01h (09h)	08h 09h . 0Eh 0Fh	Not Use	5 x 8 dots font pattern
02h (0Ah)	10h 11h . 16h 17h	Not Use	5 x 8 dots font pattern
03h (0Bh)	18h 19h . 1Eh 1Fh	Not Use	5 x 8 dots font pattern
04h (0Ch)	20h 21h . 26h 27h	Not Use	5 x 8 dots font pattern
05h (0Dh)	28h 29h . 2Eh 2Fh	Not Use	5 x 8 dots font pattern
06h (0Eh)	30h 31h . 36h 37h	Not Use	5 x 8 dots font pattern
07h (0Fh)	38h 39h . 3Eh 3Fh	Not Use	5 x 8 dots font pattern

CGRAM Address Map**9.3.2. Character code ROM**

Please refer to RW1063-0A-001 datasheet.

9.4. Display Commands

Instruction Table:

Instruction	RS	RW	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0	Description	Description Time (540KHz)
Read display data	1	1	Read data								Read data from DDRAM/CGRAM	18.5us
Write display data	1	0	Write data								Write data into DDRAM/CGRAM	18.5us
Clear Display	0	0	0	0	0	0	0	0	0	1	Write "20H" to DDRAM, and set DDRAM address to "00H" from AC	0.76ms
Return Home	0	0	0	0	0	0	0	0	1	X	Set DDRAM address to "00H" from AC and return cursor to its original position if shifted. The contents of DDRAM are not changed.	0.76ms
Entry Mode Set	0	0	0	0	0	0	0	1	I/D	S	Assign cursor moving direction and specify display shift. These operations are performed during data read and write. I/D="1": increment I/D="0": decrement	18.5us
Display ON/OFF	0	0	0	0	0	0	1	D	C	B	Set Display /Cursor/Blink On/OFF D="1": display on D="0": display off C="1": cursor on C="0": cursor off B="1": blink on B="0": blink off	18.5us
Cursor or Display shift	0	0	0	0	0	1	S/C	R/L	X	X	Cursor or display shift S/C="1": display shift S/C="0": cursor shift R/L="1": shift to right R/L="0": shift to left	18.5us
Function Set	0	0	0	0	1	DL	N	F	X	X	Set Interface Data Length DL= 8-bit interface/ 4-bit interface N = 2-line/1-line display F= 5x8 Font Size / 5x11 Font Size	18.5us
Set CGRAM Address	0	0	0	1	AC5	AC4	AC3	AC2	AC1	AC0	Set CGRAM address in address counter	18.5us
Set DDRAM Address	0	0	1	AC6	AC5	AC4	AC3	AC2	AC1	AC0	Set DDRAM address in address counter	18.5us
Read Busy Flag and Address	0	1	BF	AC6	AC5	AC4	AC3	AC2	AC1	AC0	Can know internal operation is ready or not by reading BF. The contents of address counter can also be read. BF="1": busy state BF="0": ready state	0us

Note : 1. When an MPU program with Busy Flag(DB7) checking is made, 1/2 FOSC (is necessary) for executing the next instruction by the " E " signal after the Busv Flao (DB7) does to " Low ".

NOTE:

- Do not use any other commands not listed, or the system malfunction may result.
- For the details of rte display commands, please refer to RW1063-0A-001 datasheet.

10.DESIGN AND HANDING PRECAUTION

10.1.The LCD panel is made by glass. Any mechanical shock (eg. Dropping form high place) will damage the LCD module.Do not add excessive force on the surface of the display, which may cause the Display color change abnormally.

- 10.2. The polarizer on the LCD is easily get scratched. If possible, do not remove the LCD protective film until the last step of installation.
- 10.3. Never attempt to disassemble or rework the LCD module.
- 10.4. Only Clean the LCD with Isopropyl Alcohol or Ethyl Alcohol. Other solvents (eg. water) may damage the LCD.
- 10.5. When mounting the LCD module, make sure that it is free from twisting, warping and distortion.
- 10.6. Ensure to provide enough space(with cushion) between case and LCD panel to prevent external force adding on it, or it may cause damage to the LCD or degrade the display result
- 10.7. Only hold the LCD module by its side. Never hold LCD module by add force on the heat seal or TAB.
- 10.8. Never add force to component of the LCD module. It may cause invisible damage or degrade of the reliability.
- 10.9. LCD module could be easily damaged by static electricity. Be careful to maintain an optimum anti-static work environment to protect the LCD module.
- 10.10. When peeling of the protective film from LCD, static charge may cause abnormal display pattern. It is normal and will resume to normal in a short while.
- 10.11. Take care and prevent get hurt by the LCD panel edge.
- 10.12. Never operate the LCD module exceed the absolute maximum ratings.
- 10.13. Keep the signal line as short as possible to prevent noisy signal applying to LCD module.
- 10.14. Never apply signal to the LCD module without power supply.
- 10.15. IC chip (eg. TAB or COG) is sensitive to the light. Strong lighting environment could possibly cause malfunction. Light sealing structure casing is recommend.
- 10.16. LCD module reliability may be reduced by temperature shock.
- 10.17. When storing the LCD module, avoid exposure to the direct sunlight, high humidity, high temperature or low temperature. They may damage or degrade the LCD module