DOC-C-500169

F²MC-8FX FAMILY

8-BIT MICROCONTROLLER

ALL SERIES

NEW 8FX MCU FLASH PARALLEL PROGRAMMING

SPECIFICATION

FUJITSU

Revision History

Version	Date	Updated by	Modifications
3.0.0	08/31/2010	Levi Zhang	Integrate MB953XX series parallel programming spec into one document
3.1.0	09/14/2010	Levi Zhang	Update operation timing and bin code Update signal name, RDY -> SYNC
3.2.0	10/08/2010	Levi Zhang	Update RSTX description Update parallel mode entry flow
3.3.0	10/182010	Levi Zhang	Change LPC-8FX to New 8FX in this document
3.4.0	11/19/2010	Levi Zhang	Update bin code for NVR (0FFBCH[6:5]) handle
3.6.0	11/24/2010	Folix Li	Add MB95F430H series product programming
3.7.0	03/11/2011	Lee Song	Add MB95F410/470 series product programming
3.7.1	06/22/2011	Levi Zhang	Add LQFP52 package info for MB95F390 series
4.0.0	09/27/2011	Levi Zhang	Unify document format and create a new spec (this document). Add MB95630 series MCU support
4.1.0	07/09/2012	Amy Qian	Add MB95650 series MCU support Add MB95690 series MCU support Add MB95710 series MCU support Add MB95810 series MCU support Add MB95870 series MCU support

This manual contains 61 pages.

Contents

1 Introduction

This specification defines the principle of New 8FX MB953XX/4XX/6XX/7XX/8XX MCU parallel programming for programming supplier.

The below products are supported.

- MB95F330/390 series
- MB95F310/370 series
- MB95F350 series
- MB95F430 series
- MB95F410/470 series
- MB95F630 series
- MB95F650 series
- MB95F690 series
- MB95F710 series
- MB95F810 series
- MB95F870 series

2 MCU Packages

2.1 MB95F330H Series Packages

Part number / Package	MB95F332H	MB95F332K	MB95F333H	MB95F333K	MB95F334H	MB95F334K
FPT-32P-M30	O	O	O	O	O	O
DIP-32P-M06	O	O	O	O	O	O
LCC-32P-M19	O	O	O	O	O	O

O: Available

- The corresponding package dimensions information is described in MCU data sheet, which can be downloaded through the below website.
- http://www.fujitsu.com/cn/fss/mcu/mb95/index_mb95330.html

2.2 MB95F390H Series Packages

Part number / Package	MB95F394H	MB95F396H	MB95F398H	MB95F394K	MB95F396K	MB95F398K
FPT-48P-M49	O	O	O	O	O	O
FPT-52P-M02	O	O	O	O	O	O
LCC-48P-M11	O	O	O	O	O	O

O: Available

- The corresponding package dimensions information is described in MCU data sheet, which can be downloaded through the below website.
- http://www.fujitsu.com/cn/fss/mcu/mb95/index_mb95390.html

2.3 MB95F310/370L Series Packages

Part number / Package	MB95F314E	MB95F316E	MB95F318E	MB95F314L	MB95F316L	MB95F318L
FPT-80P-M37	O					
FPT-64P-M38	X					
FPT-64P-M39	X					

Part number / Package	MB95F374E	MB95F376E	MB95F378E	MB95F374L	MB95F376L	MB95F378L
FPT-80P-M37	X					
FPT-64P-M38	O					
FPT-64P-M39	O					

O: Available
X: Unavailable

- The corresponding package dimensions information is described in MCU data sheet, which can be downloaded through the below website.
- http://www.fujitsu.com/cn/fss/mcu/mb95/index_mb95310mb95370.html

2.4 MB95F350L Series Packages

Part number / Package	MB95F352E	MB95F353E	MB95F354E	MB95F352L	MB95F353L	MB95F354L
FPT-24P-M34	O	O	O	O	O	O
FPT-24P-M10	O	O	O	O	O	O
LCC-32P-M19	O	O	O	O	O	O

O: Available

- The corresponding package dimensions information is described in MCU data sheet, which can be downloaded through the below website.
- http://www.fujitsu.com/cn/fss/mcu/mb95/index_mb95350.html

2.5 MB95F430H Series Packages

Part number / Package	MB95F432H	MB95F433H	MB95F434H	MB95F432K	MB95F433K	MB95F434K
FPT-32P-M30	O	O	O	O	O	O
DIP-32P-M06	O	O	O	O	O	O

O: Available

- The corresponding package dimensions information is described in MCU data sheet, which can be downloaded through the below website.
- http://www.fujitsu.com/cn/fss/mcu/mb95/index_mb95430.html

2.6 MB95F410/470 Series Packages

Part number / Package	MB95F414H	MB95F416H	MB95F418H	MB95F414K	MB95F416K	MB95F418K
FPT-80P-M37	O					

O: Available

Part number / Package	MB95F474H	MB95F476H	MB95F478H	MB95F474K	MB95F476K	MB95F478K
FPT-64P-M38	O					
FPT-64P-M39	O					

O: Available

- The corresponding package dimensions information is described in MCU data sheet, which can be downloaded through the below website.
- http://www.fujitsu.com/cn/fss/mcu/mb95/index_mb95410mb95470.html

2.7 MB95F630H Series Packages

Part number / Package	MB95F632H	MB95F632K	MB95F633H	MB95F633K	MB95F634H	MB95F634K	MB95F636H	MB95F636K
FPT-32P-M30	O	O	O	O	O	O	O	O
DIP-32P-M06	O	O	O	O	O	O	O	O
LCC-32P-M19	O	O	O	O	O	O	O	O

O: Available

- The corresponding package dimensions information is described in MCU data sheet, which can be downloaded through the below website.
- http://www.fujitsu.com/cn/fss/mcu/mb95/index_mb95630.html

2.8 MB95F650L Series Packages

■ PACKAGES AND CORRESPONDING PRODUCTS

Part number / Package	MB95F652E	MB95F653E	MB95F654E	MB95F656E	MB95F652L	MB95F653L	MB95F654L	MB95F656L
FPT-24P-M10	O	O	O	O	O	O	O	O
FPT-24P-M34	O	O	O	O	O	O	O	O
LCC-32P-M19	O	O	O	O	O	O	O	O

O: Available

- The corresponding package dimensions information is described in MCU data sheet, which can be downloaded through the below website.
  TBD

2.9 MB95F690K Series Packages

■ PACKAGES AND CORRESPONDING PRODUCTS

Part number / Package	MB95F694K	MB95F696K	MB95F698K
FPT-48P-M49	O	O	O
FPT-52P-M02	O	O	O
LCC-48P-M11	O	O	O

O: Available

- The corresponding package dimensions information is described in MCU data sheet, which can be downloaded through the below website.
- http://www.fujitsu.com/cn/fss/mcu/mb95/index_mb95690.html

2.10 MB95F710L Series Packages

Part number / Package	MB95F714E	MB95F716E	MB95F718E	MB95F714L	MB95F716L	MB95F718L
FPT-80P-M37	O	O	O	O	O	O

O: Available

- The corresponding package dimensions information is described in MCU data sheet, which can be downloaded through the below website.
  TBD

2.11 MB95F810L Series Packages

Part number / Package	MB95F814K	MB95F816K	MB95F818K
FPT-64P-M38	O	O	O
FPT-64P-M39	O	O	O

O: Available

- The corresponding package dimensions information is described in MCU data sheet, which can be downloaded through the below website.
- http://www.fujitsu.com/cn/fss/mcu/mb95/index_mb95810.html

2.12 MB95F870K Series Packages

■ PACKAGES AND CORRESPONDING PRODUCTS

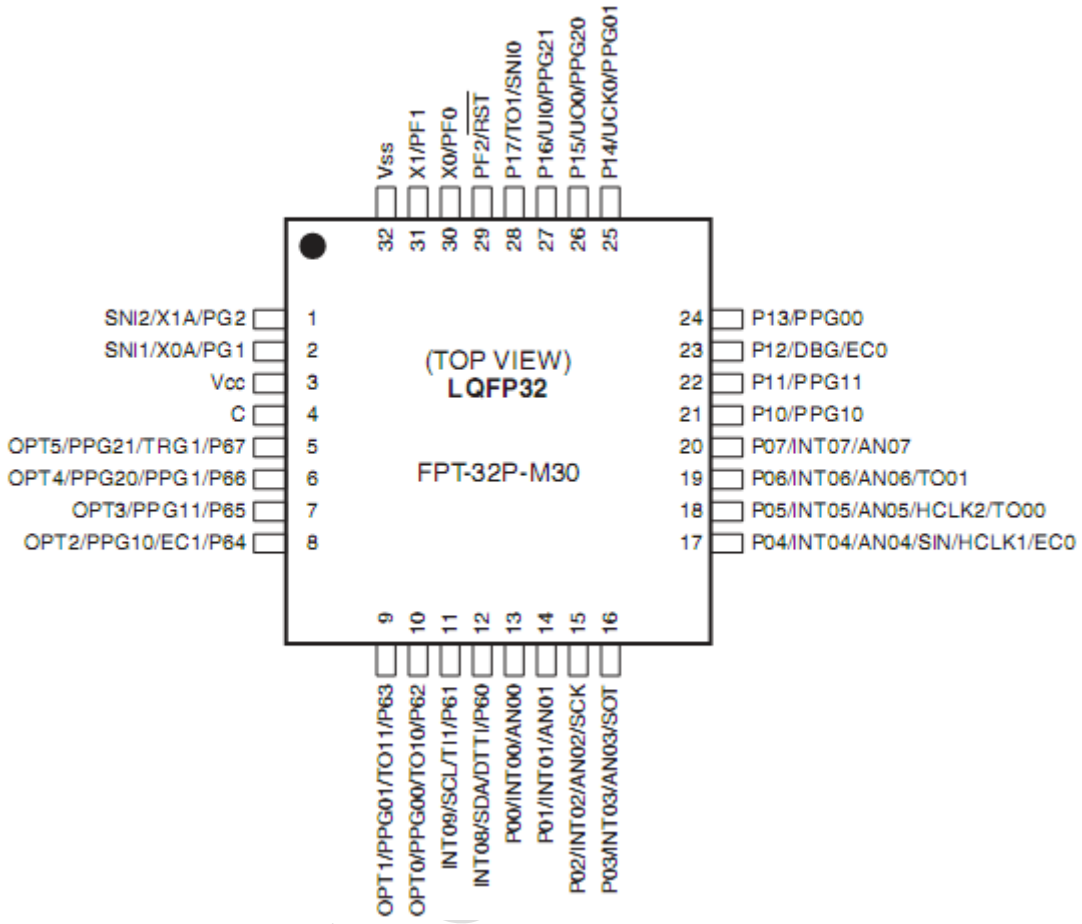
Part number / Package	MB95F856K	MB95F866K	MB95F876K
FPT-24P-M10	O	X	X
FPT-24P-M34	O	X	X
FPT-32P-M30	X	O	X
FPT-48P-M49	X	X	O
FPT-52P-M02	X	X	O

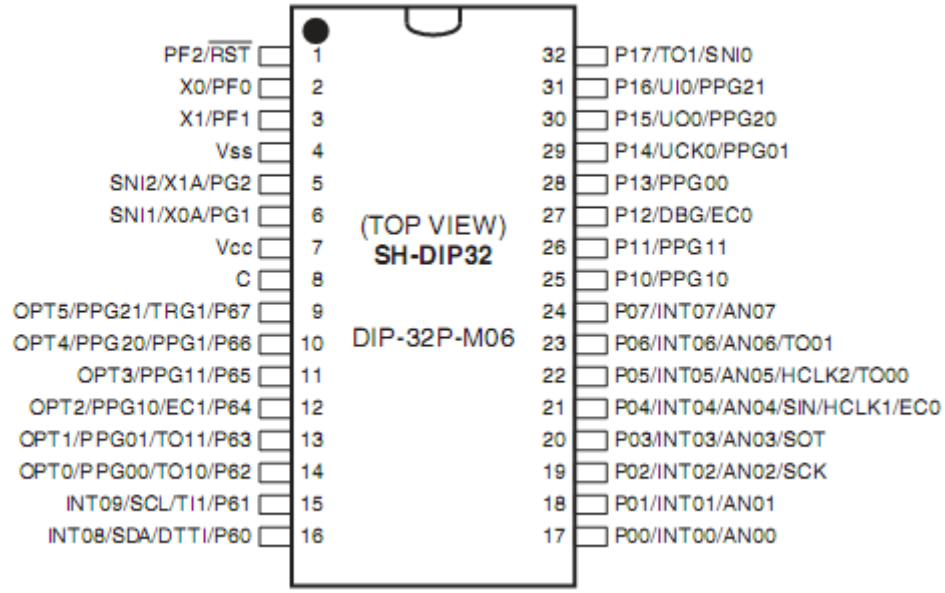
O: Available
X: Unavailable

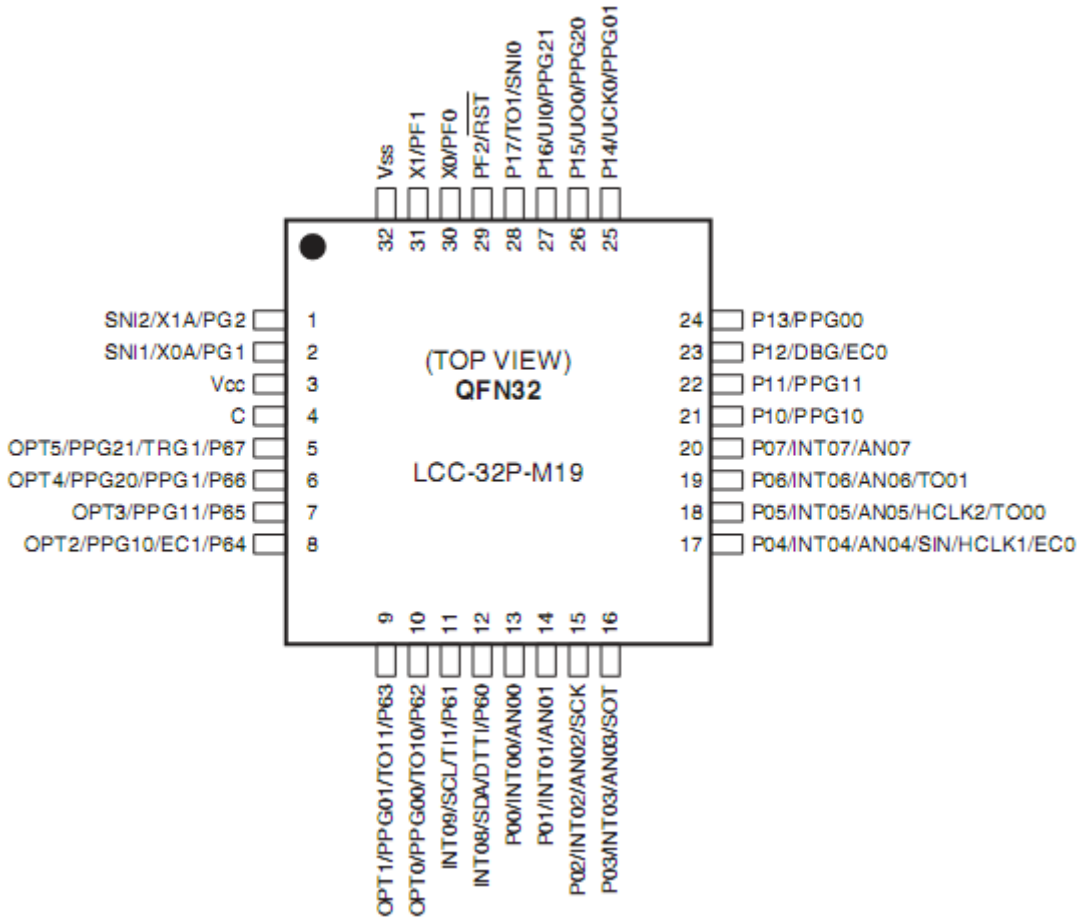
- The corresponding package dimensions information is described in MCU data sheet, which can be downloaded through the below website.
- http://www.fujitsu.com/cn/fss/mcu/mb95/index_mb95870mb95860mb95850.html

3 MCU Pin Assignments

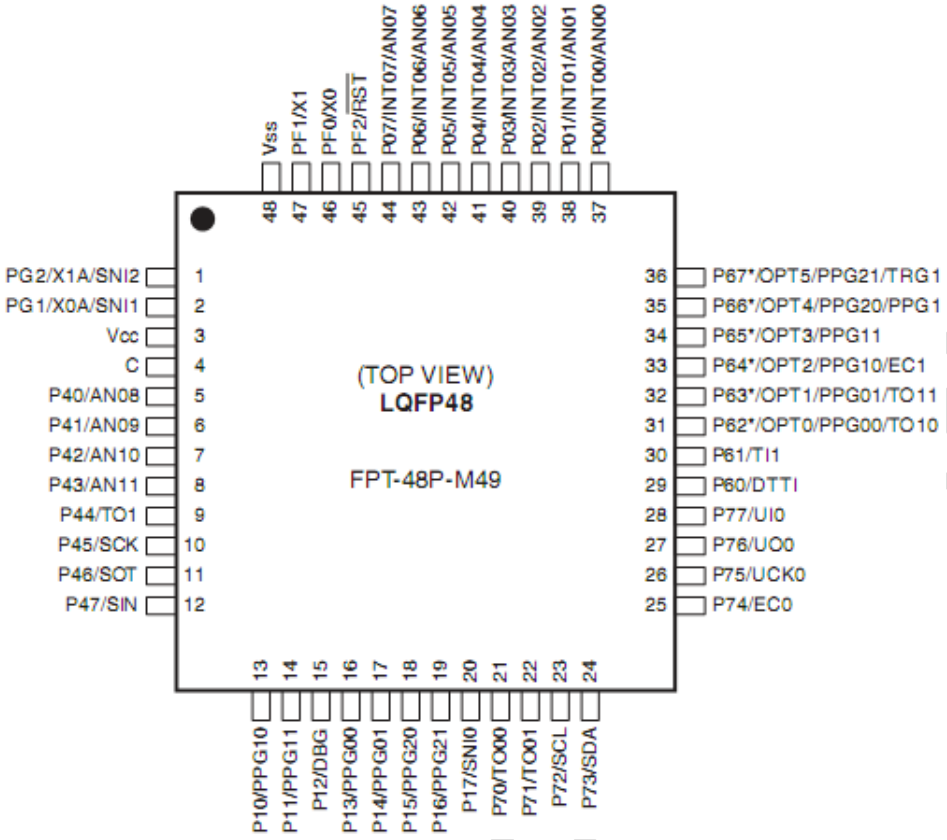
3.1 MB95330H Series Pin Assignments

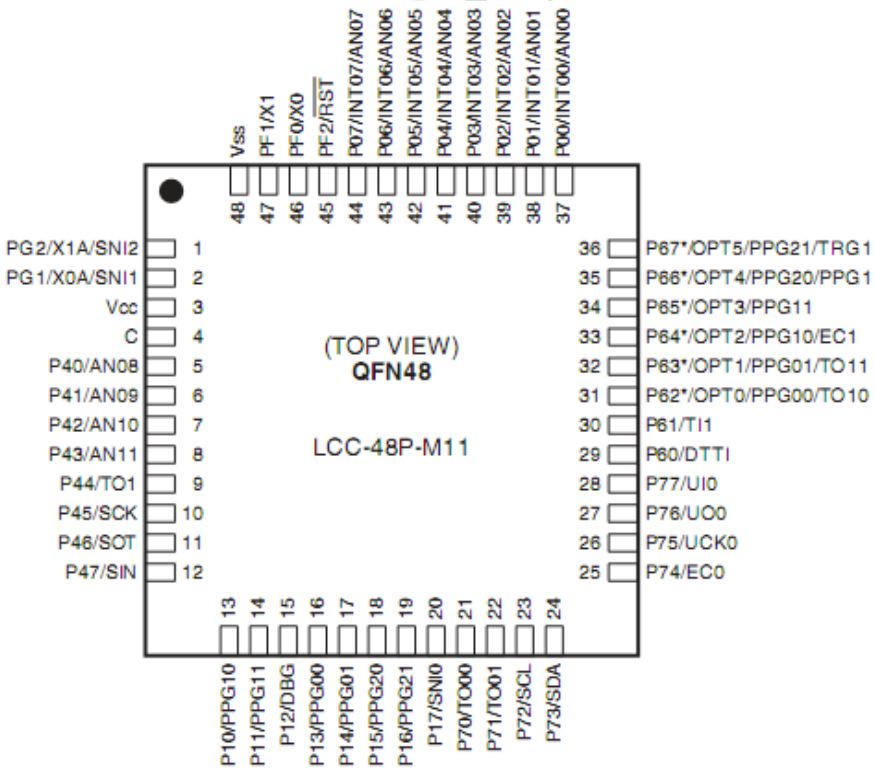


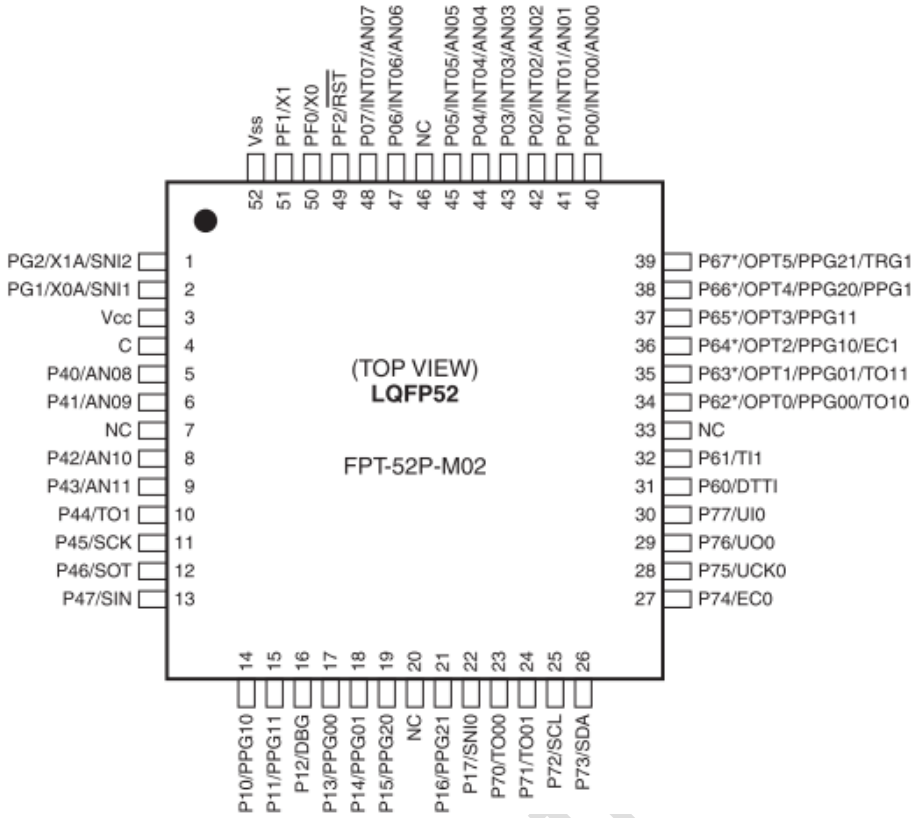



Vss
X1/PF1
X0/PF0
PF2/RST
P17/TO1/SNI0
P16/UI0/PPG21
P15/UO0/PPG20
P14/UCK0/PPG01
32
31
30
29
28
27
26
25
SNI2/X1A/PG2
SNI1/X0A/PG1
Vcc
C
OPT5/PPG21/TRG1/P67
OPT4/PPG20/PPG1/P66
OPT3/PPG11/P65
OPT2/PPG10/EC1/P64
1
2
3
4
5
6
7
8
(TOP VIEW)
QFN32
LCC-32P-M19
24
23
22
21
20
19
18
17
P13/PPG00
P12/DBG/EC0
P11/PPG11
P10/PPG10
P07/INT07/AN07
P06/INT06/AN06/TO01
P05/INT05/AN05/HCLK2/TO00
P04/INT04/AN04/SIN/HCLK1/EC0
9
10
11
12
13
14
15
16
OPT1/PPG01/TO11/P63
OPT0/PPG00/TO10/P62
INT09/SCL/TI1/P61
INT08/SDA/DTTI/P60
P00/INT00/AN00
P01/INT01/AN01
P02/INT02/AN02/SCK
P03/INT03/AN03/SOT

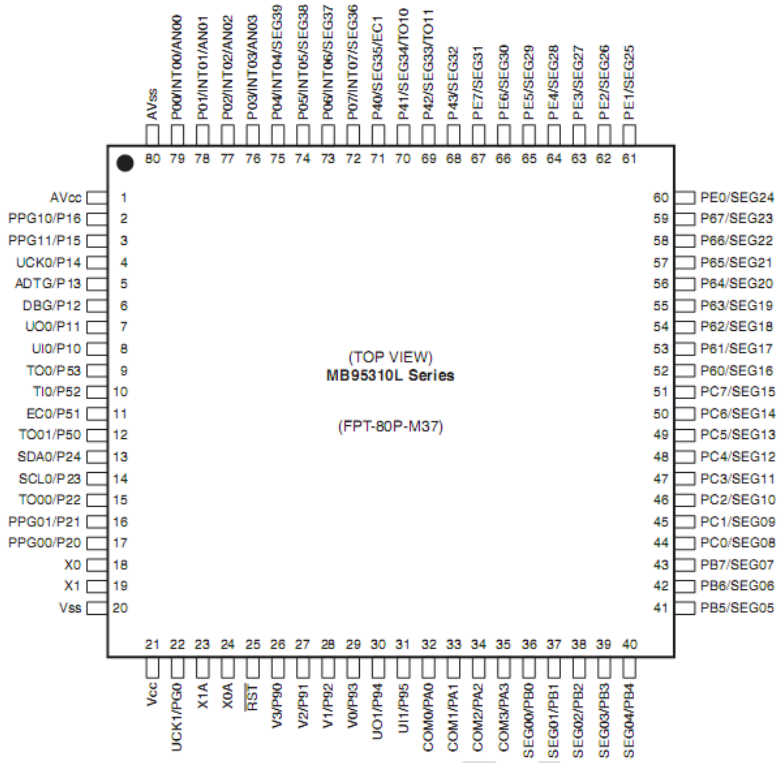
3.2 MB95390H Series Pin Assignments

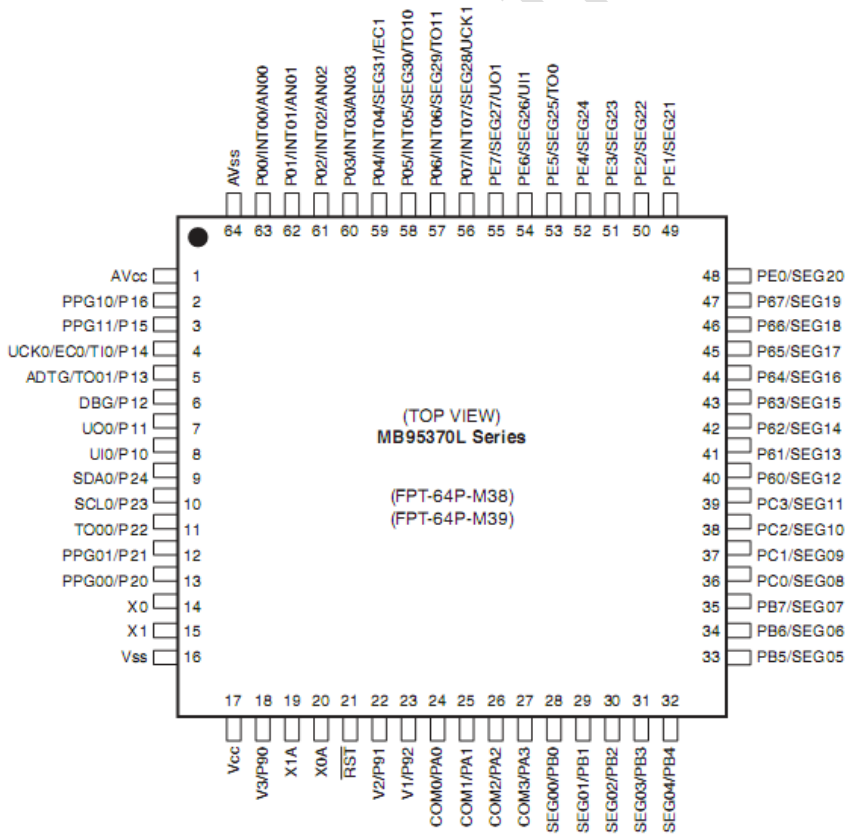




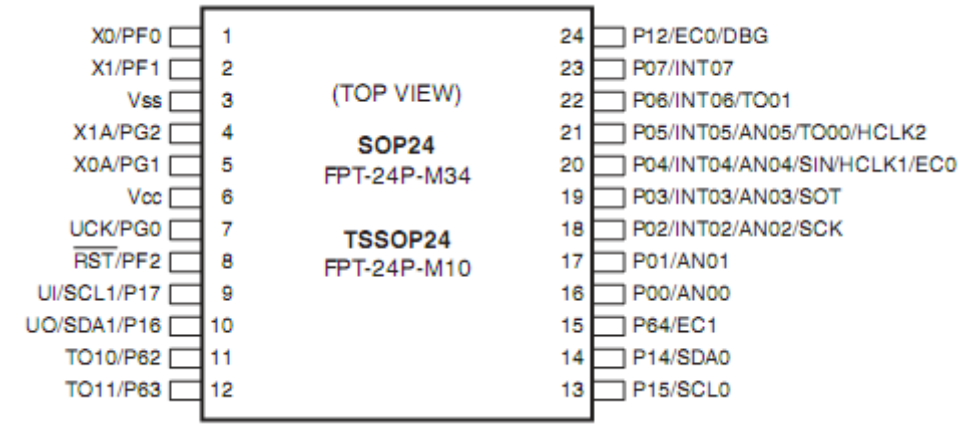


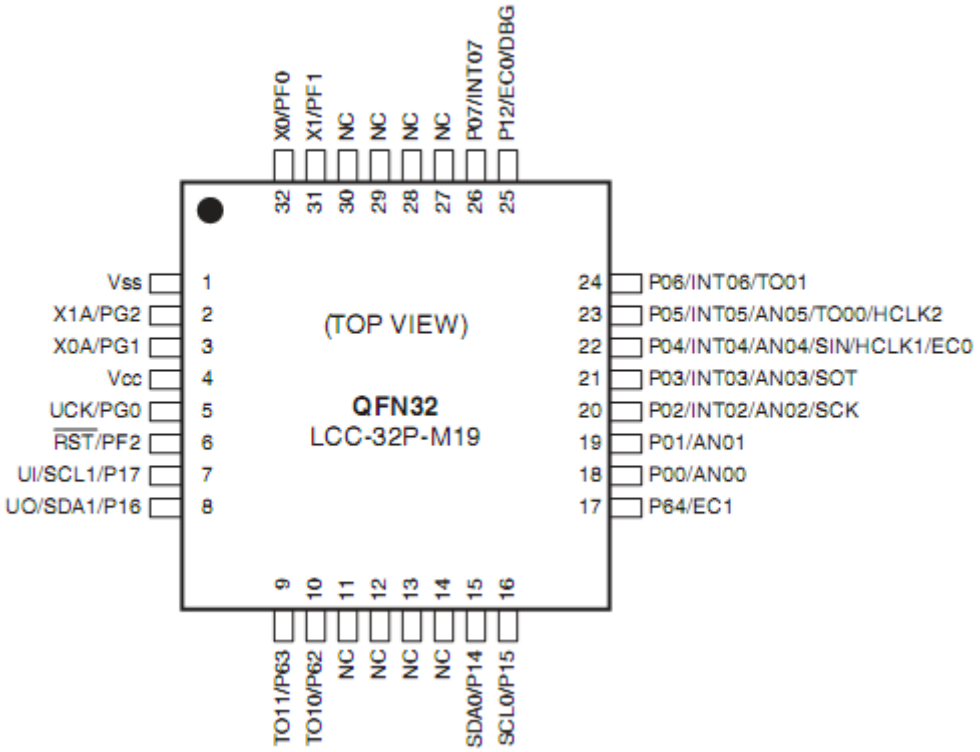
3.3 MB95310/370L Series Pin Assignments



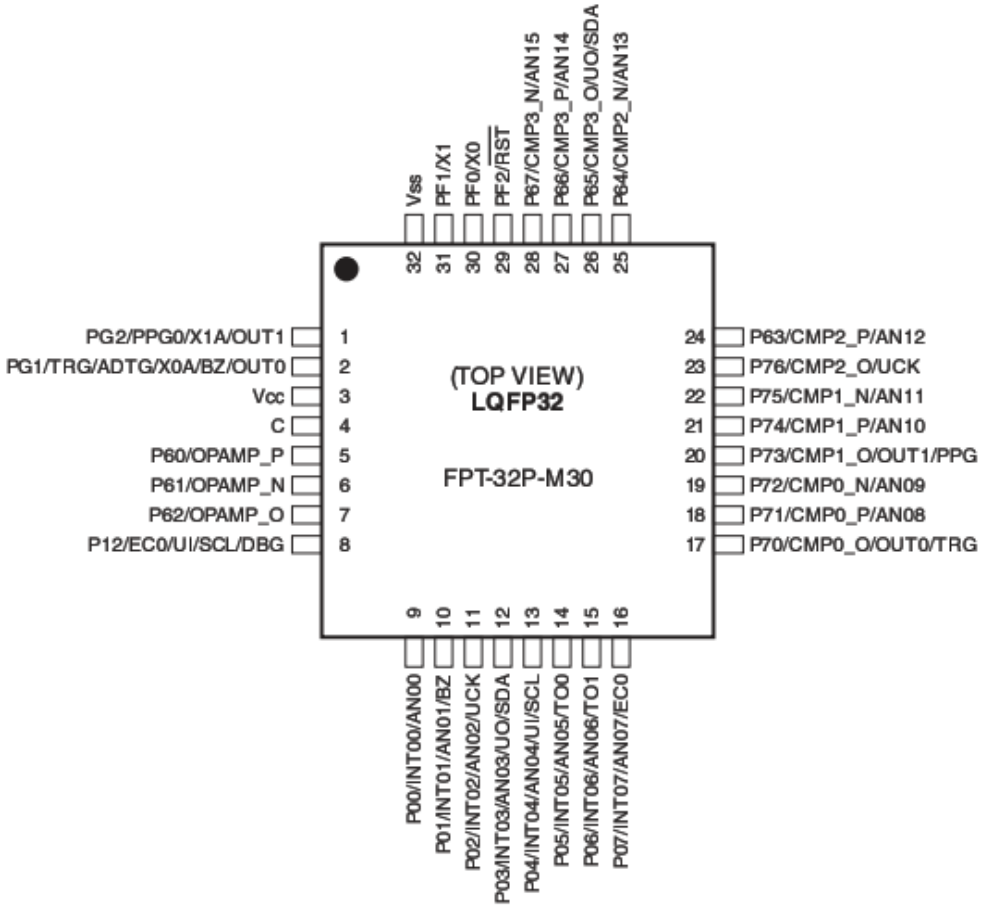


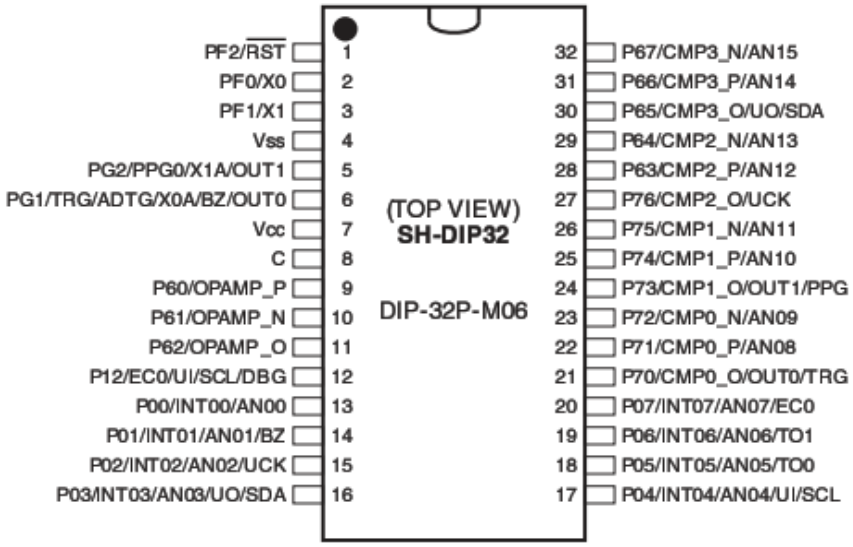
3.4 MB95350L Series Pin Assignments



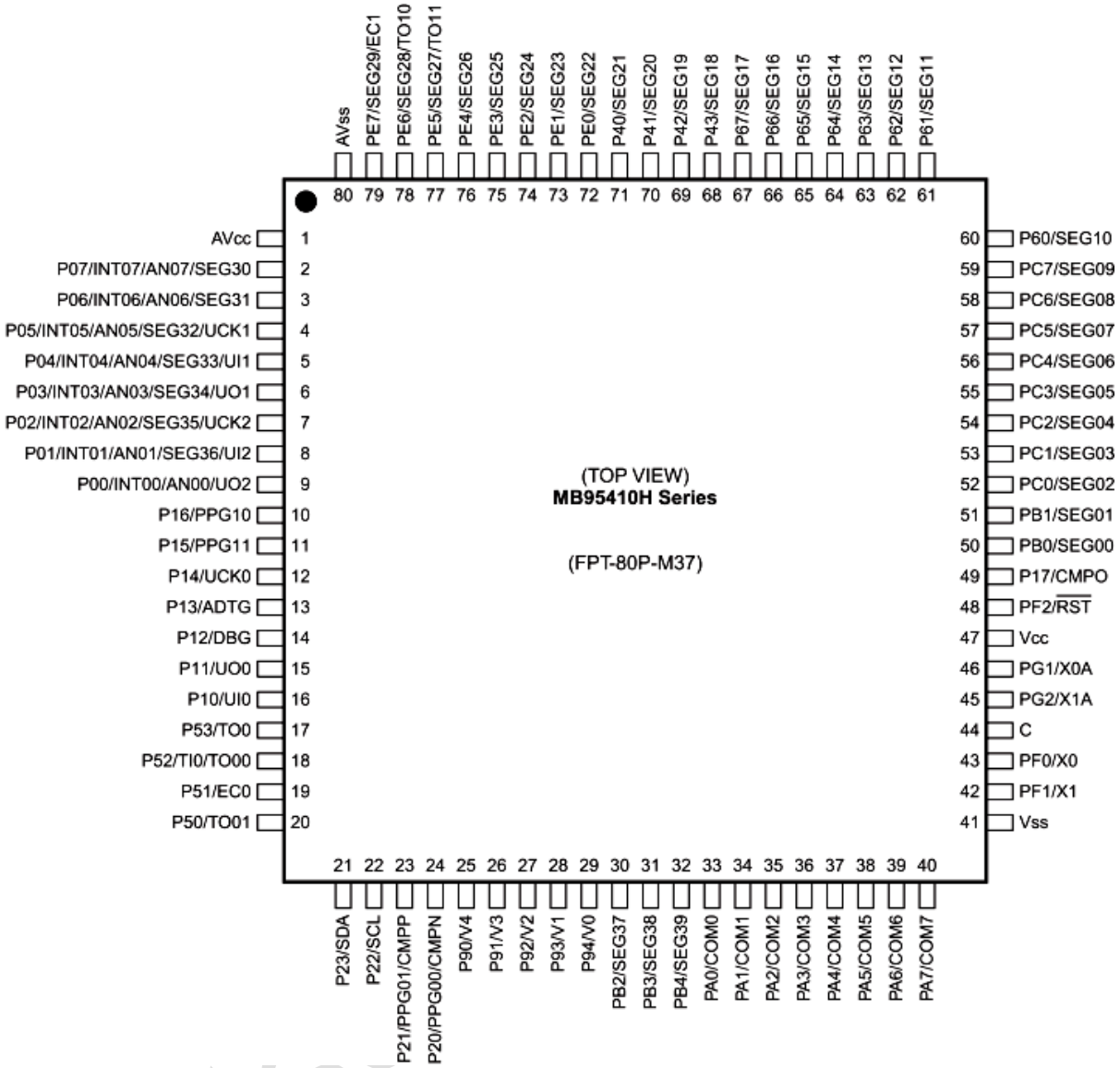


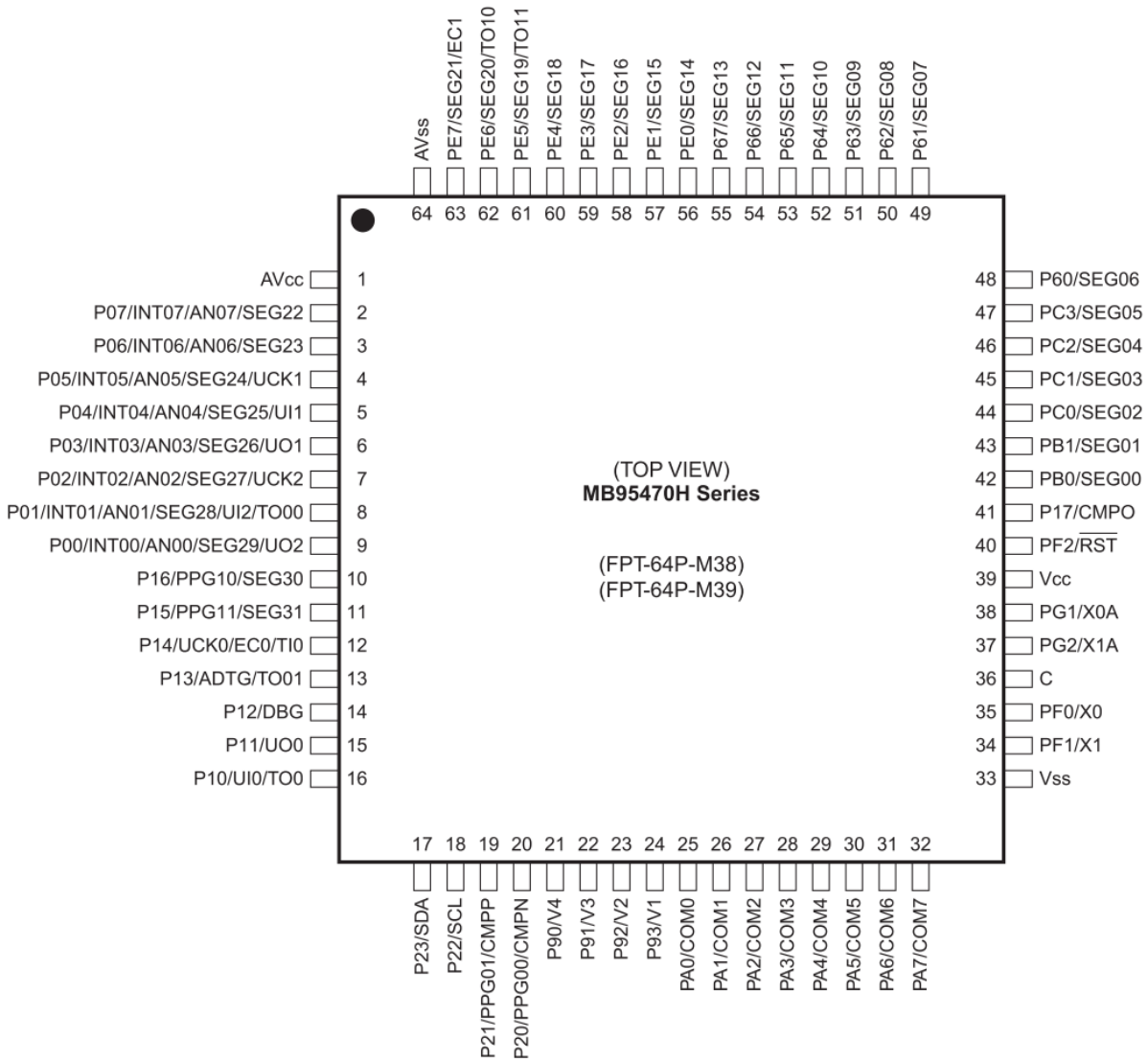
3.5 MB95F430H Series Pin Assignments



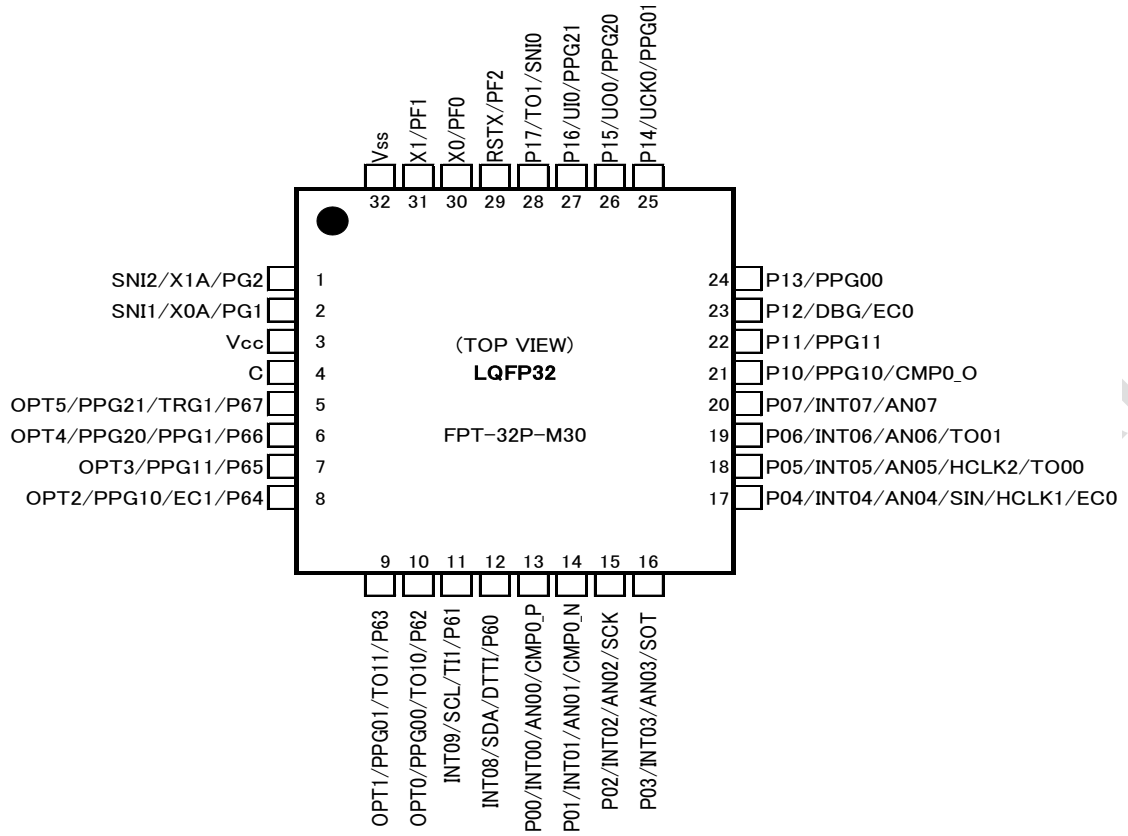


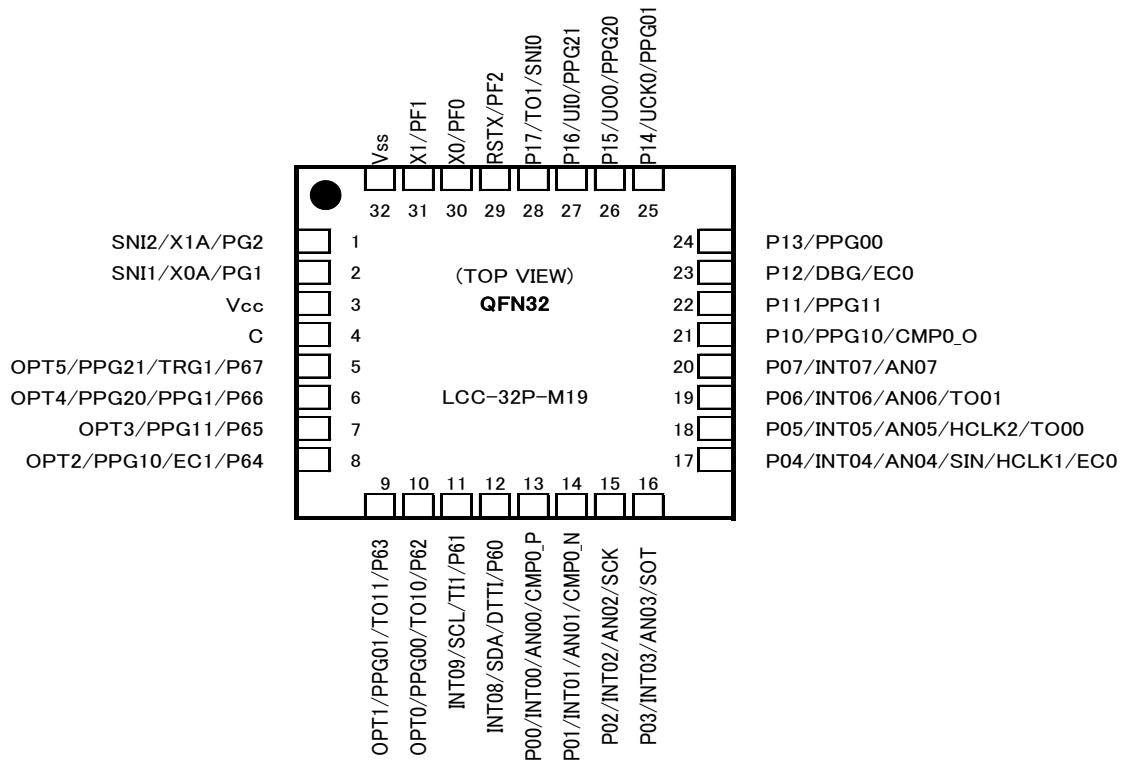
3.6 MB95F410/470H Series Pin Assignments

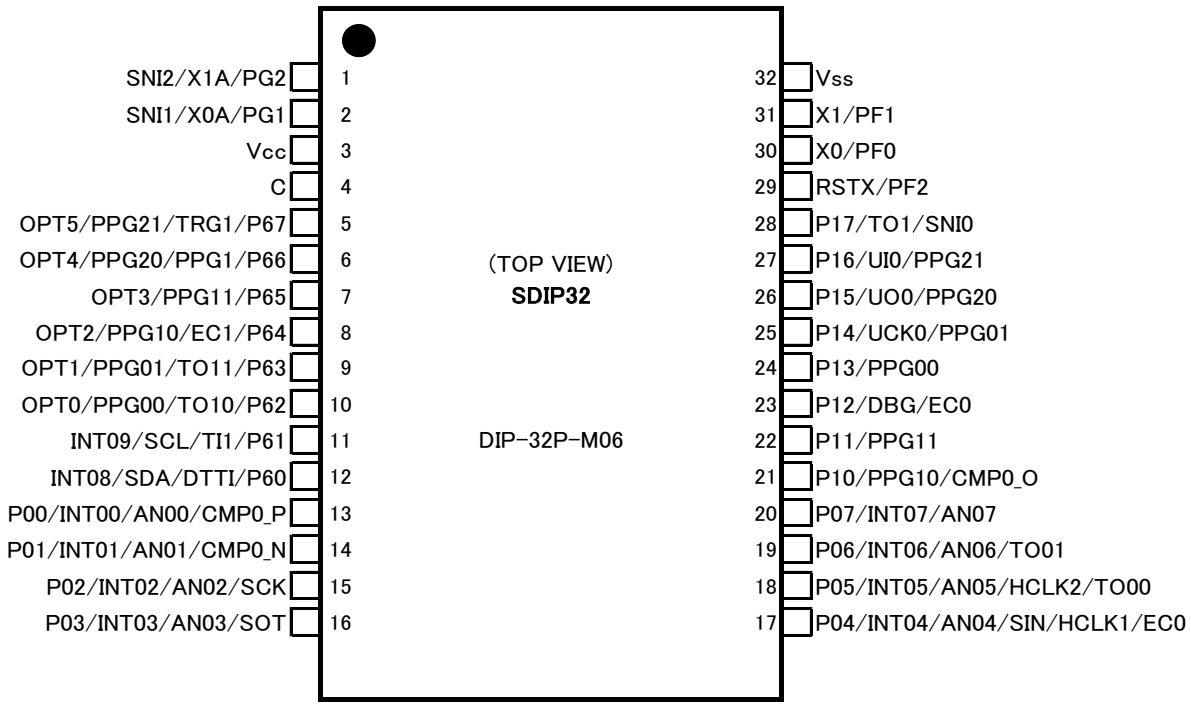



AVss 64
PE7/SEG21/EC1 63
PE6/SEG20/TO10 62
PE5/SEG19/TO11 61
PE4/SEG18 60
PE3/SEG17 59
PE2/SEG16 58
PE1/SEG15 57
PE0/SEG14 56
P67/SEG13 55
P66/SEG12 54
P65/SEG11 53
P64/SEG10 52
P63/SEG09 51
P62/SEG08 50
P61/SEG07 49
AVcc 1
P07/INT07/AN07/SEG22 2
P06/INT06/AN06/SEG23 3
P05/INT05/AN05/SEG24/UCK1 4
P04/INT04/AN04/SEG25/UI1 5
P03/INT03/AN03/SEG26/UO1 6
P02/INT02/AN02/SEG27/UCK2 7
P01/INT01/AN01/SEG28/UI2/TO00 8
P00/INT00/AN00/SEG29/UO2 9
P16/PPG10/SEG30 10
P15/PPG11/SEG31 11
P14/UCK0/EC0/TI0 12
P13/ADTG/TO01 13
P12/DBG 14
P11/UO0 15
P10/UI0/TO0 16
(TOP VIEW)
MB95470H Series
(FPT-64P-M38)
(FPT-64P-M39)
48 P60/SEG06
47 PC3/SEG05
46 PC2/SEG04
45 PC1/SEG03
44 PC0/SEG02
43 PB1/SEG01
42 PB0/SEG00
41 P17/CMPO
40 PF2/RST
39 Vcc
38 PG1/X0A
37 PG2/X1A
36 C
35 PF0/X0
34 PF1/X1
33 Vss
17 P23/SDA
18 P22/SCL
19 P21/PPG01/CMPP
20 P20/PPG00/CMPN
21 P90/V4
22 P91/V3
23 P92/V2
24 P93/V1
25 PA0/COM0
26 PA1/COM1
27 PA2/COM2
28 PA3/COM3
29 PA4/COM4
30 PA5/COM5
31 PA6/COM6
32 PA7/COM7

3.7 MB95F630H Series Pin Assignments

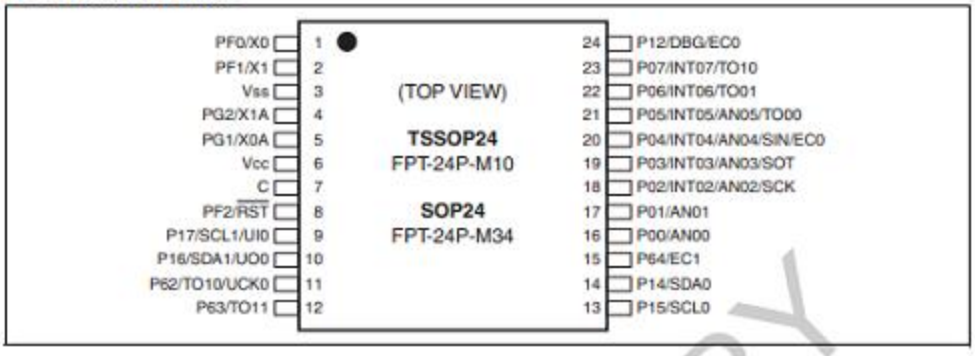


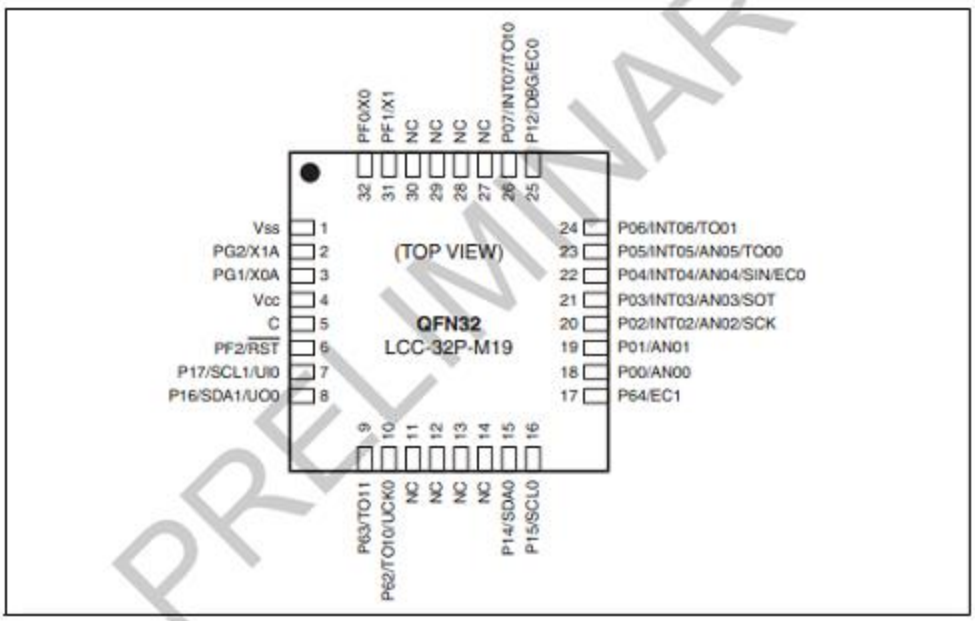




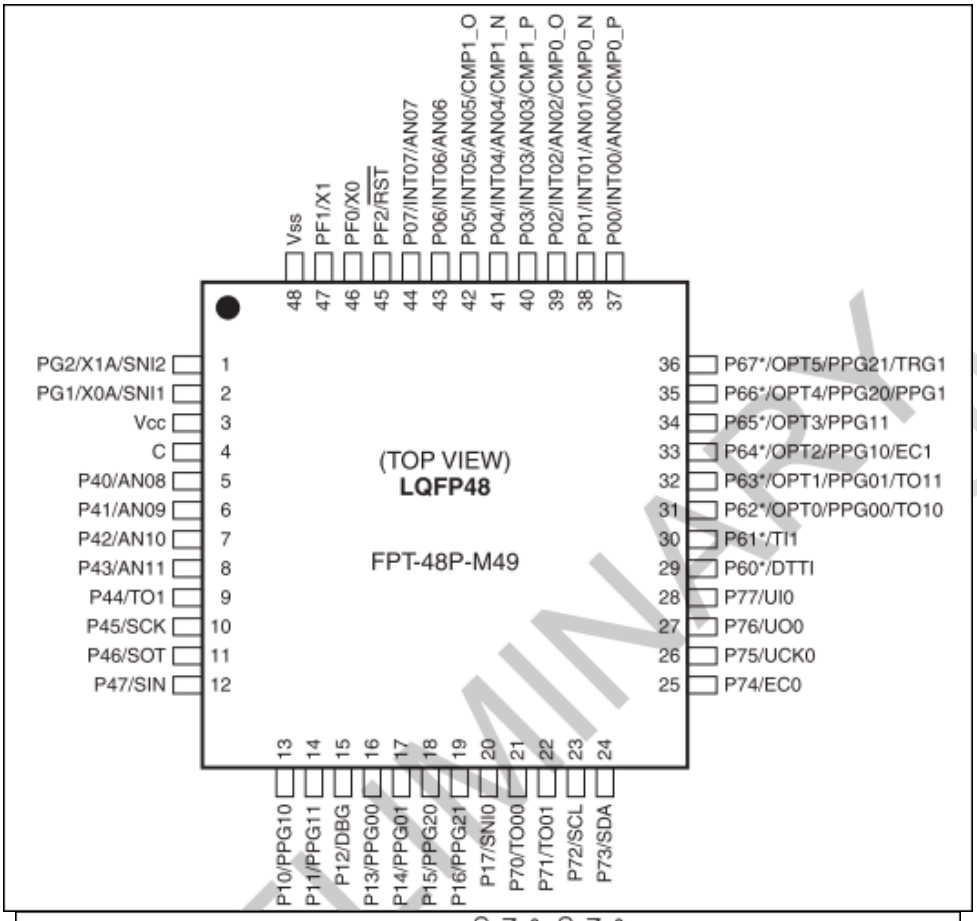
3.8 MB95F650L Series Pin Assignments

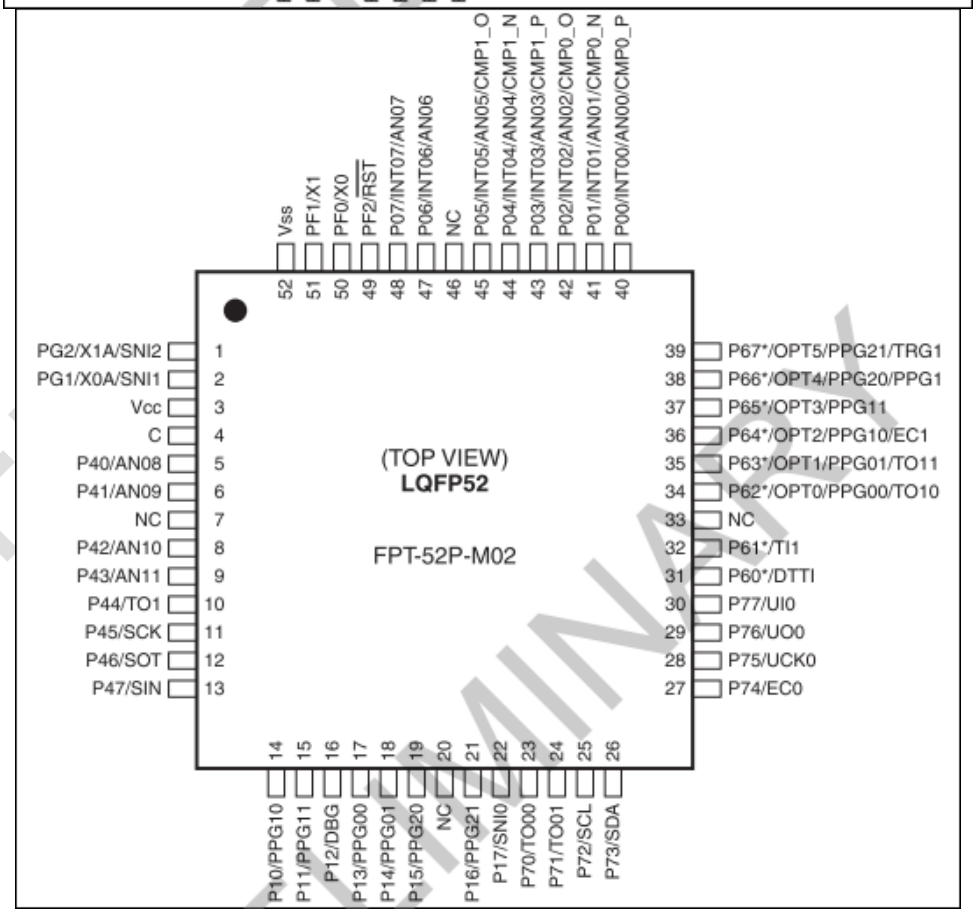
■ PIN ASSIGNMENT



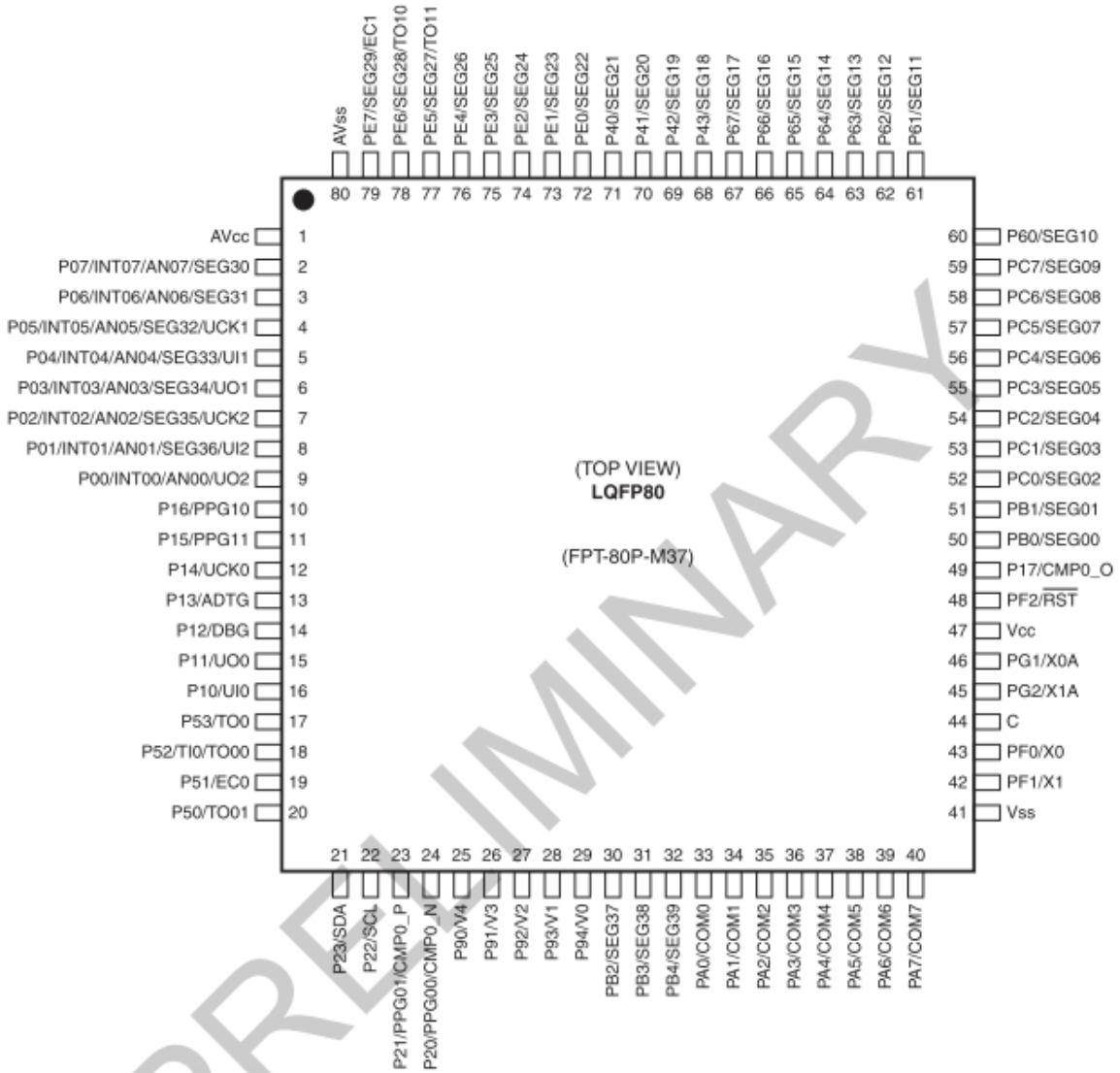


3.9 MB95F690K Series Pin Assignments

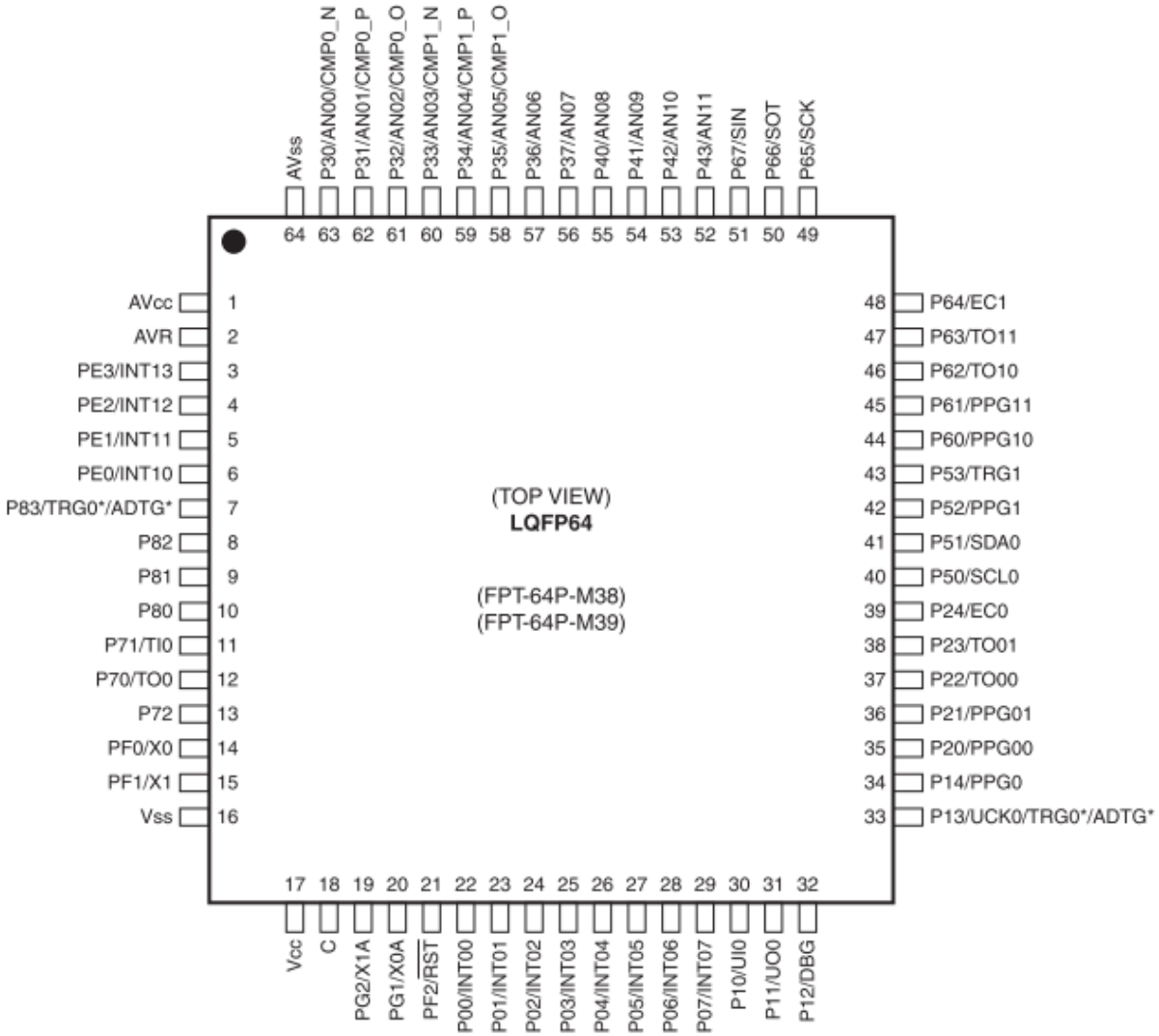




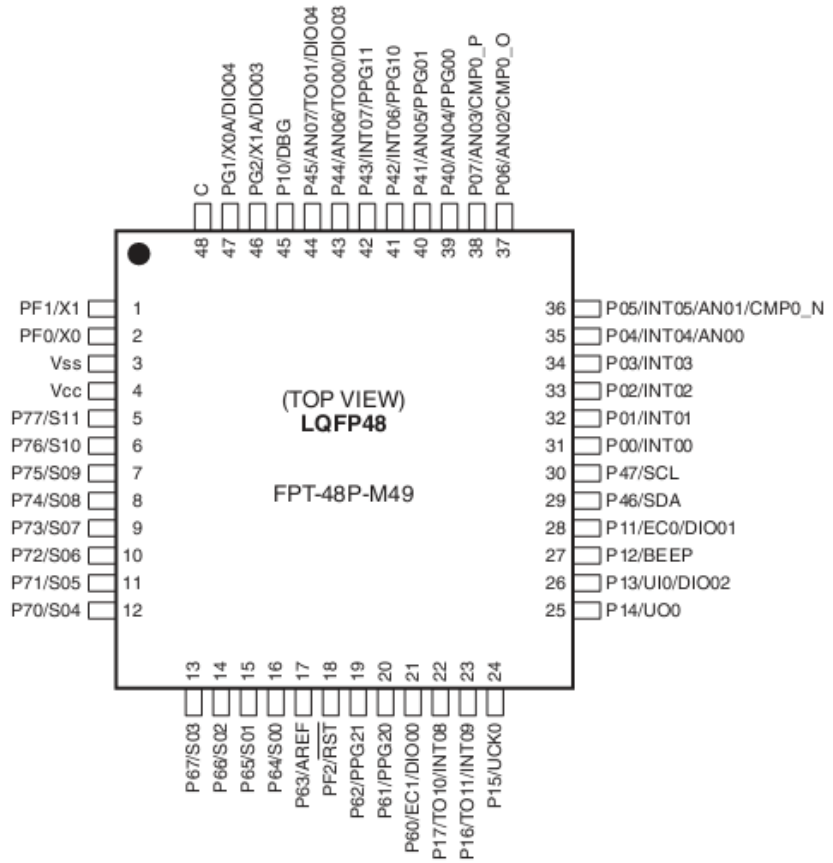
3.10 MB95F710L Series Pin Assignments

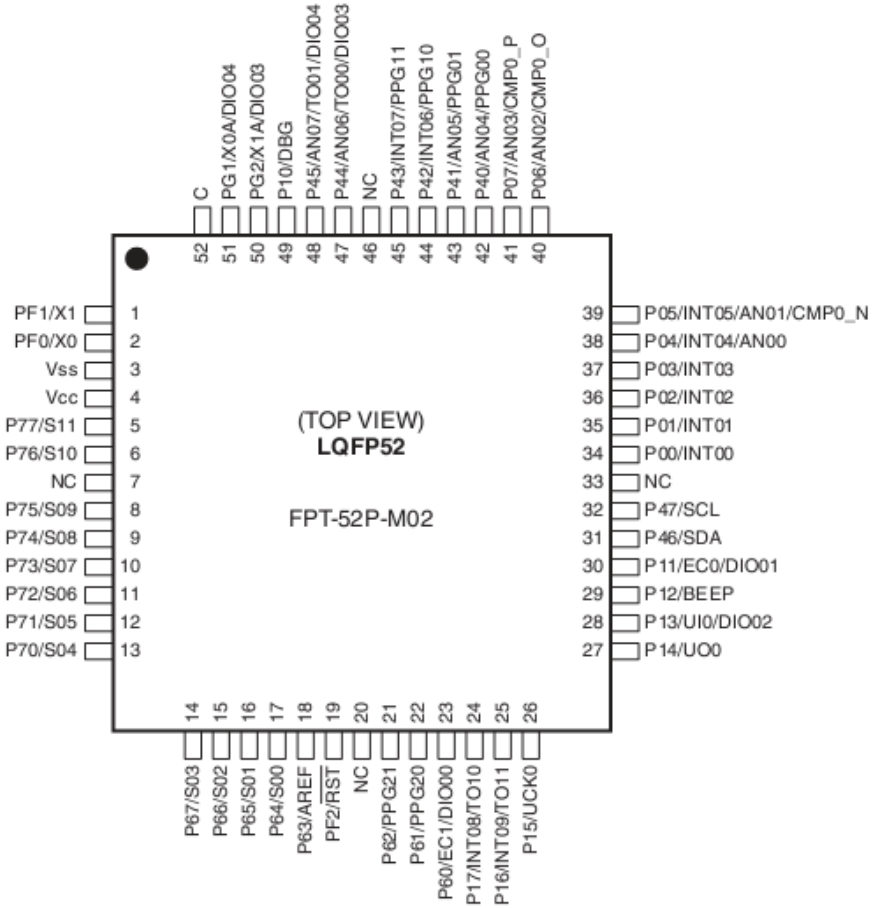


3.11 MB95F810L Series Pin Assignments



3.12 MB95F870K Series Pin Assignments





4 MCU Flash Memory Map

4.1 MB95330H Series Memory Map

New 8FX MB Number	Flash Size	Programmer/MCU Address
MB95F334H/F334K	20KB	B000H~FFFFH
MB95F333H/F333K	12KB	B000H~BFFFH E000H~FFFFH
MB95F332H/F332K	8KB	B000H~BFFFH F000H~FFFFH

4.2 MB95390H Series Memory Map

New 8FX MB Number	Flash Size	Programmer/MCU Address
MB95F398H/F398K	60KB	1000H~FFFFH
MB95F396H/F396K	36KB	1000H~1FFFH 8000H~FFFFH
MB95F394H/F394K	20KB	1000H~1FFFH C000H~FFFFH

4.3 MB95310/370L Series Memory Map

New 8FX MB Number	Flash Size	Programmer/MCU Address
MB95F314E/F314L/374E/374L	20KB	1000H~1FFFH C000H~FFFFH
MB95F316E/F316L/376E/376L	36KB	1000H~1FFFH 8000H~FFFFH
MB95F318E/F318L/378E/378L	60KB	1000H~FFFFH

4.4 MB95350L Series Memory Map

New 8FX MB Number	Flash Size	Programmer/MCU Address
MB95F354H/F354K	20KB	B000H~FFFFH
MB95F353H/F353K	12KB	B000H~BFFFH E000H~FFFFH
MB95F352H/F352K	8KB	B000H~BFFFH F000H~FFFFH

4.5 MB95F430H Series Memory Map

New 8FX MB Number	Flash Size	Programmer/MCU Address
MB95F432H/F432K	8KB	B000H~BFFFH F000H~FFFFH
MB95F433H/F433K	12KB	B000H~BFFFH E000H~FFFFH
MB95F434H/F434K	20KB	B000H~FFFFH

4.6 MB95F410/470H Series Memory Map

New 8FX MB Number	Flash Size	Programmer/MCU Address
MB95F414H/F414K/F474H/F474K	20KB	1000H~1FFFH C000H~FFFFH
MB95F416H/F416K/F476H/F476K	36KB	1000H~1FFFH 8000H~FFFFH
MB95F418H/F418K/F478H/F478K	60KB	1000H~FFFFH

4.7 MB95F630H Series Memory Map

New 8FX MB Number	Flash Size	Programmer/MCU Address
MB95F632H/F632K	8KB	1000H~1FFFH F000H~FFFFH
MB95F633H/F633K	12KB	1000H~1FFFH E000H~FFFFH
MB95F634H/F634K	20KB	1000H~1FFFH C000H~FFFFH
MB95F636H/F636K	36KB	1000H~1FFFH 8000H~FFFFH

4.8 MB95F650L Series Memory Map

New 8FX MB Number	Flash Size	Programmer/MCU Address
MB95F656E/L	36KB	1000H~1FFFH 8000H~FFFFH
MB95F654E/L	20KB	1000H~1FFFH C000H~FFFFH
MB95F653E/L	12KB	1000H~1FFFH E000H~FFFFH
MB95F652E/L	8KB	1000H~1FFFH F000H~FFFFH

4.9 MB95F690K Series Memory Map

New 8FX MB Number	Flash Size	Programmer/MCU Address
MB95F694K	20KB	1000H~1FFFH C000H~FFFFH
MB95F696K	36KB	1000H~1FFFH 8000H~FFFFH
MB95F698K	60KB	1000H~FFFFH

4.10 MB95F710L Series Memory Map

New 8FX MB Number	Flash Size	Programmer/MCU Address
MB95F718E/L	60KB	1000H~FFFFH
MB95F716E/L	36KB	1000H~1FFFH 8000H~FFFFH
MB95F714E/L	20KB	1000H~1FFFH C000H~FFFFH

4.11 MB95F810L Series Memory Map

New 8FX MB Number	Flash Size	Programmer/MCU Address
MB95F818E/L	60KB	1000H~FFFFH
MB95F816E/L	36KB	1000H~1FFFH 8000H~FFFFH
MB95F814E/L	20KB	1000H~1FFFH C000H~FFFFH

4.12 MB95F870K Series Memory Map

New 8FX MB Number	Flash Size	Programmer/MCU Address
MB95F876K	36KB	1000H~1FFFH 8000H~FFFFH

5 Parallel Programming

5.1 Overview

To improve the program performance, adopt 8-bit parallel interface instead of 1-line UART interface.

To realize parallel function, initialize target MCU operation should be completed firstly by 1-line UART method. *1

Figure 5–1 shows how to program Target MCU.

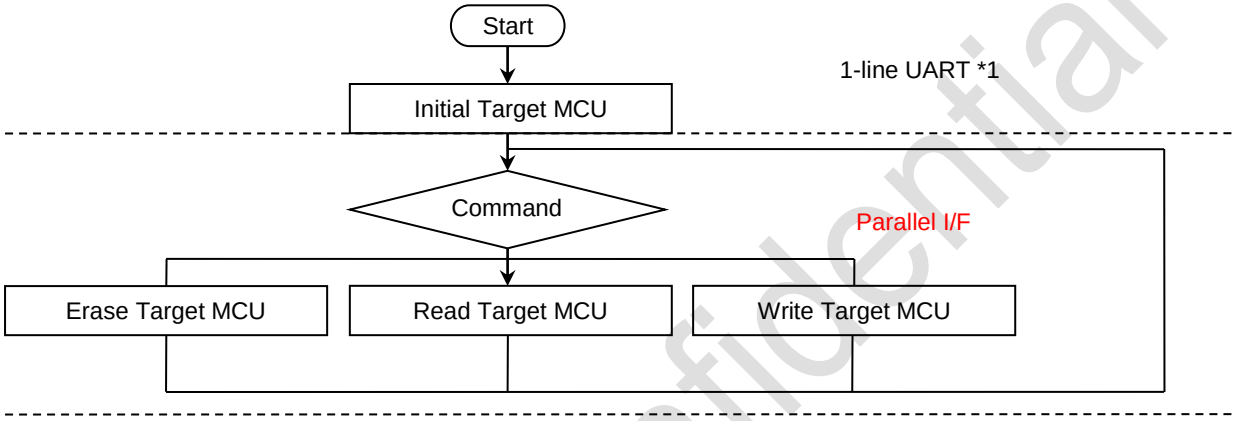


Figure 5–1: Flow Chart of Program Target MCU

*1 Refer to sector 7

5.2 Performance Estimation

- Parallel interface
- Faster program speed, performance as below

Table 5-1: Performance of Parallel Programming

Action		Estimated Performance (Typical)	Remark
Chip Erase	1*	500mS (16K)	Refer to the DS
	2*	2.5S	Erase 60K and write 2 bytes NVR (1000H - FFFFH)
Write Flash	1*	160uS	3*
	2*	100uS	Write 1 byte
Read Flash	1*	160uS	3*
	2*	50uS	Read 1 byte

1* Serial programming

2* Parallel programming

3* Refer to "New 8FX MCU Flash Serial Programming Spec"

6 Hardware Connection

6.1 MB95F3XX/410/470/6XX/710/810/870 Series Hardware Connection

The connection and pin usage are shown as below; total 16 pins are used in parallel programming solution

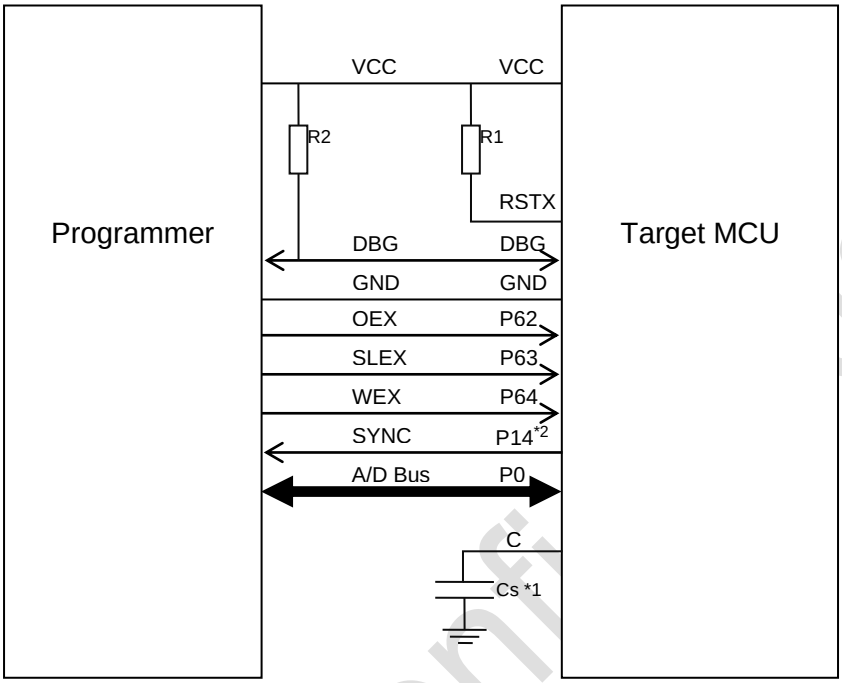


Figure 6–1: Connection between Programmer and Target MCU

Components Recommendation:

R1, R2: 10KΩ

Cs: 0.022uF/25V

Note:

*1: If this product includes C pin.

*2: MB95F650 Series: P14 pin need to connect pull-up resistor

6.2 MB95F430 Series Hardware Connection

The connection and pin usage are shown as below; total 16 pins are used in parallel programming solution

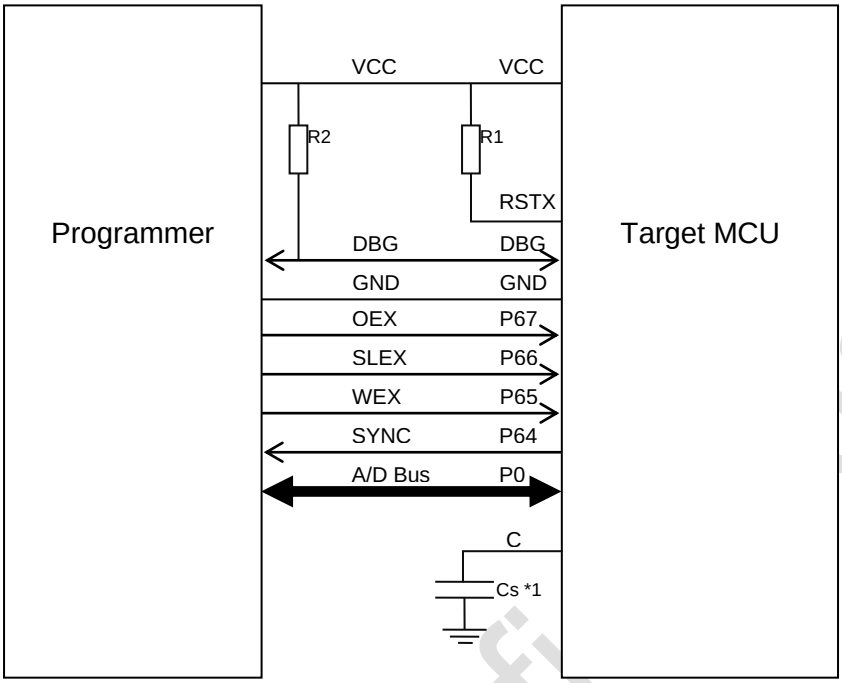


Figure 6–2: Connection between Programmer and Target MCU

Components Recommendation:

R1, R2: 10KΩ

Cs: 0.022pF/25V

Note:

*1: If this product includes C pin.

6.3 Target MCU Programming Pin Definition

The Pin assignment of Target MCU is as below.

Table 6-1 Pin assignment of Target MCU

Pin	Direction	Function
VCC		Power supply
GND		Power supply (GND)
RSTX	Input	Reset
DBG	Input/output	Mode control and 1-line UART
OEX	Input	Read enable Programmer set OEX 'L' to Target MCU before read data '0': Enable, programmer can read data via A/D bus while OEX is 'L' '1': Disable read
SLEX	Input	Command enable Programmer set SLEX 'L' to Target MCU before send command '0': Enable, programmer can send command to target MCU while SLEX is 'L' '1': Disable send command
WEX	Input	Write enable Programmer set WEX 'L' to Target MCU before send Write Data '0': Enable, WEX must be set to 'L' before write operation '1': Disable write
SYNC	Output	Target MCU status signal SYNC used to SYNC programmer and target MCU Detail description please refers to each function.
P0	Input/output	A/D bus, receive/Send Data from/to Programmer; [P07..P00] → [Bit7..Bit0]

For communicating with Target MCU, some pins of Programmer must be assigned to match pins of Target MCU.

In this way, the HW connection is prepared, and then Programmer can control Target MCU to realize parallel programming.

7 Parallel Programming Mode Entry

To realize parallel programming, flash initialization operation of target MCU should be completed firstly, target MCU will enter parallel programming mode after it. Then, programmer can realize erase/write/read/blank check/verify handling via parallel interface.

7.1 Overview

Below flow shows how to enter parallel programming mode.

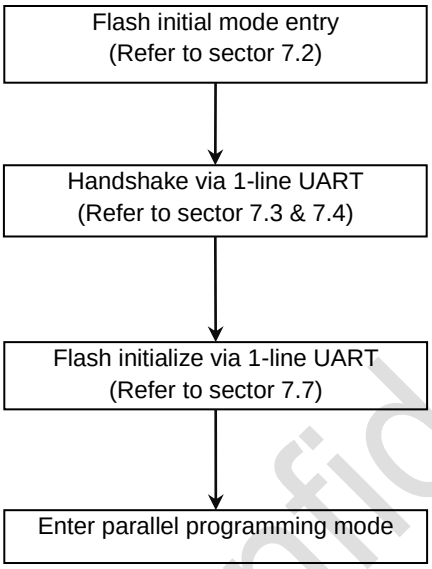


Figure 7–1: Flow Chart of Enter Parallel Programming Mode

7.2 Flash Initial Mode Entry Timing Chart

The following timing will enable New 8FX MCU enter PGM mode.

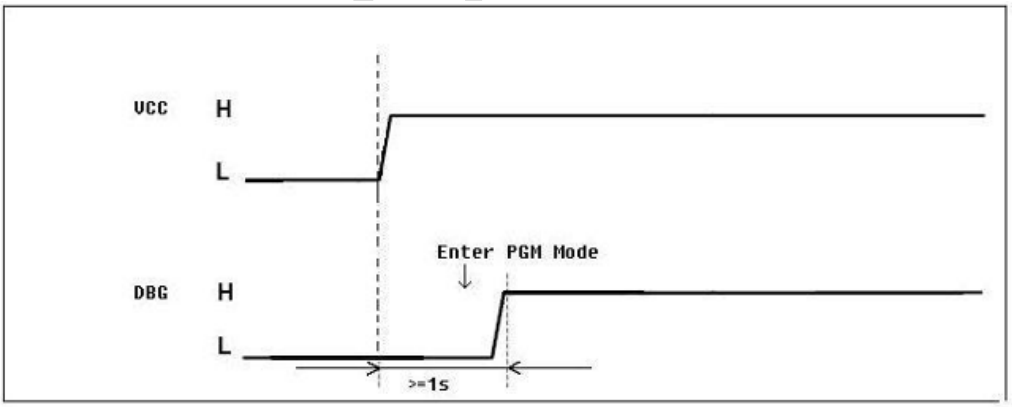


Figure 7–2: Flash Initial Mode Entry Timing Chart

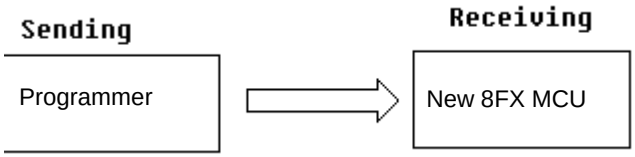
7.3 1-line UART Communication Specification

1-line UART features:

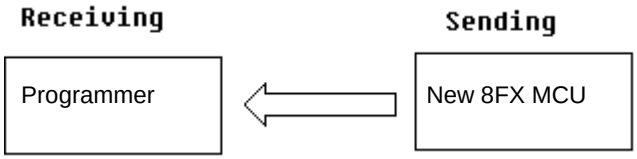
- Baud rate = 62500bps
- 8 bit data length
- 1 bit stop bit
- No parity
- LSB first

All the communications are initialized by Programmer. Programmer is Master and MCU is Slave during PGM mode.

The 1-line UART between programmer and New 8FX MCU is half-duplex, so data transfer is unidirectional.



Command frame is transferred from Programmer to MCU. Programmer is in sending status, while MCU is in receiving status;



Return frame is transferred from MCU to Programmer. Programmer is in receiving status, while MCU is in sending status;

Both command frame and return frame transfer at the same time is forbidden based on the 1-line UART communication.

7.4 Hand-shake Process

After first power on entry, hand-shake with New 8FX MCU is necessary before executing PGM command. The following is the hand-shank process:

After first reset, programmer sends two bytes (0x55AA) to MCU repeatedly. There is an interval (≥3ms) between 0x55 and 0xAA. Then PGM waits some time (≥6.6ms) for the ACK from MCU. Repeating 20 times until ACK (0x51) is received.

If programmer receives 0x51 after sending 0x55AA commands, CR Trimming completes successfully.
In this case, programmer needs wait for 1ms before sending the following commands.

If programmer receives no ACK (or ACK is not 0x51) in 20 times, hand-shake fails. It is necessary for programmer to power on MCU again and re-do the hand-shake operation.

7.5 1-line UART Command Format Overview

Programmer can send commands to MCU only after hand-shake succeeds.

They are fixed to 5 bytes for 1 unit, as shown below:

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5
Function Code	Data H	Data L	Checksum	ACK

Checksum is the sum of Function Code, Data H and Data L.

Normal ACK value is 0x00; flash security ACK is 0xFD. Other ACK means operation error.

Note: Only 1-line UART communication adopts this command format.

7.6 Erase Command Sequences

Programmer needs to keep 1ms interval time between each byte UART data transmitting to ensure MCU can received these commands during sending them.

The erase command is shown below.

Table 7-1: Erase Command Sequences

Communication Byte Number	Transmit/Receive Data	Description		Communication Direction
1st byte	0x00	Fixed Data	Parameter set (62500bps)	PGM *1 to MCU
2nd byte	0x00	Fixed Data		PGM to MCU
3rd byte	0x0C	Fixed Data		PGM to MCU
4th byte	0x0C	Checksum		PGM to MCU
5th byte	0x00	ACK		MCU to PGM
1st byte	0x05	Fixed Data	Parameter set (62500bps)	PGM to MCU
2nd byte	0x00	Fixed Data		PGM to MCU
3rd byte	0x60	Fixed Data		PGM to MCU
4th byte	0x65	Checksum		PGM to MCU
5th byte	0x00	ACK		MCU to PGM
1st byte	0x06	Fixed Data	Flash Erase (62500bps)	PGM to MCU
2nd byte	0x##	Sector Addr H		PGM to MCU
3rd byte	0x##	Sector Addr L		PGM to MCU
4th byte	0x06	Fixed Data		PGM to MCU
…	Erasing…			…
5th byte	0x00 *2	ACK		MCU to PGM

In sector erase operation, “Sector Addr H” and “Sector Addr L” in the last command indicate the sector to be erased. The value must be an effective address in the sector. For example, if sector C which is from 0xC000 to 0xFFFF will be erased, the value of “Sector Addr H” can be in 0xC0~0xFF and the value of “Sector Addr L” can be in 0x00~0xFF.

In chip erase operation, both “Sector Addr H” and “Sector Addr L” must be 0x00.

More than 35s timeout-time waiting for ACK is recommended. The typical erase time can be referred in the below chapter 11.

The chip erase time should be the summation of every sector operation time.

To ensure that the flash memory of target MCU is blank, it recommends that implement flash erase operation before flash initialization.

Note

*1. From here, “PGM” is the shortened form of “programmer”.

*2. If flash security is enabled, “0xFD” will be returned here (Sector erase only, chip erase won’t get “0xFD” return.

7.7 Flash Initialize Command

The following is command sequences to download the code that MCU type corresponding flash Initialize data of chapter12 to RAM of target MCU.

Table 7-2: Flash Initialize Command 1

Communication Byte Number	Transmit/Receive Data	Description		Communication Direction
1st byte	0x00	Fixed Data	Parameter set (62500bps)	PGM to MCU
2nd byte	0x00	Fixed Data		PGM to MCU
3rd byte	0x0C	Fixed Data		PGM to MCU
4th byte	0x0C	Checksum		PGM to MCU
5th byte	0x00	ACK		MCU to PGM
1st byte	0x05	Fixed Data	Parameter set (62500bps)	PGM to MCU
2nd byte	0x00	Fixed Data		PGM to MCU
3rd byte	0x60	Fixed Data		PGM to MCU
4th byte	0x65	Checksum		PGM to MCU
5th byte	0x00	ACK		MCU to PGM
1st byte	0x00	Fixed Data	Parameter set (62500bps)	PGM to MCU
2nd byte	0x00	Fixed Data		PGM to MCU
3rd byte	0x90	Fixed Data		PGM to MCU
4th byte	0x90	Checksum		PGM to MCU
5th byte	0x00	ACK		MCU to PGM
6th byte	0x03	Fixed Data	Write memory (62500bps)	PGM to MCU
7th byte	0x00	Fixed Data		PGM to MCU
8th byte	1st data in initial Table*1	Data		PGM to MCU
9th byte	6th+7th+8th	Checksum		PGM to MCU
10th byte	0x00 *2	ACK		MCU to PGM
11th byte	0x03	Fixed Data	Write memory (62500bps)	PGM to MCU
12th byte	0x00	Fixed Data		PGM to MCU
13th byte	2nd data in Table 1	Data		PGM to MCU
14th byte	11th+12th+13th	Checksum		PGM to MCU
15th byte	0x00	ACK		MCU to PGM
Repeat 11th~15th …	Send all data in bin code table and below…	…	Write memory (62500bps)	…

Table 7-3: Flash Initialize Command 2

Communication Byte Number	Transmit/Receive Data	Description		Communication Direction
N-19 byte	0x00	Fixed Data	Parameter set (62500bps)	PGM to MCU
N-18 byte	0x00	Fixed Data		PGM to MCU
N-17 byte	0x00	Fixed Data		PGM to MCU
N-16 byte	0x00	Checksum		PGM to MCU
N-15 byte	0x00	ACK		MCU to PGM
N-14 byte	0x05	Fixed Data	Parameter set (62500bps)	PGM to MCU
N-13 byte	0x00	Fixed Data		PGM to MCU
N-12 byte	0x00	Fixed Data		PGM to MCU
N-11 byte	0x05	Checksum		PGM to MCU
N-10 byte	0x00	ACK		MCU to PGM
N-9 byte	0x05	Fixed Data	Parameter set (62500bps)	PGM to MCU
N-8 byte	0x00	Fixed Data		PGM to MCU
N-7 byte	0x90	Fixed Data		PGM to MCU
N-6 byte	0x95	Checksum		PGM to MCU
N-5 byte	0x00	ACK		MCU to PGM
N-4 byte	0x09	Fixed Data	GO (62500bps)	PGM to MCU
N-3 byte	0x00	Fixed Data		PGM to MCU
N-2 byte	0x00	Fixed Data		PGM to MCU
N-1 byte	0x09	Checksum		PGM to MCU
N byte	0x00	ACK		MCU to PGM

In this case, read and write command will not be effective.

And then, Programmer could erase/write/read flash of Target MCU by sending command.

It means when the code runs in RAM of Target MCU, the preparative for the parallel programming is finished.

Note

*1: Please refer to chapter 12.1 Flash Initialize Data for each product in details.

*2: If flash security is enabled, “0xFD” will be returned here.

8 Basic Operation of Target MCU

For realize function of parallel programming, 3 basic operations of target MCU could be used. They are erase, write, read function. After initialized flash of target MCU, these 3 basic operations can be implement by receiving and implementing command from Programmer.

To control Target MCU to erase/write/read, the following command must be sent by parallel port, and 1-line UART command cannot be accepted by target MCU

8.1 Command Sending Sequence

To send command to Target MCU, special format of command must be adopted by Programmer, the special format is shown in Figure 8–1.

PGM → MCU

D1(Byte)	D2(Byte)	D3(Byte)	D4(Byte)	D5(Byte)
Command	AddressH	AddressL	LengthH	LengthL

MCU → PGM

D1+ … + D5(Byte)
Check Sum

Figure 8–1: Format of Command Frame

And Checksum = D1+D2+D3+D4+D5, which is used to check if command is received by Target MCU correctly, for how to use checksum, refer to 8.3 Erase Flash, 8.4 Write Flash, 8.5 Read Flash.

Dn: D1, D2, D3, D4 or D5

For Erase Command (0x55), D1 = 0x55

For Read Command (0x18), D1 = 0x18

For Write Command (0x81), D1 = 0x81

To send one byte to Target MCU, must set PORT output, the timing of Erase Command send is shown in Figure 8–2.

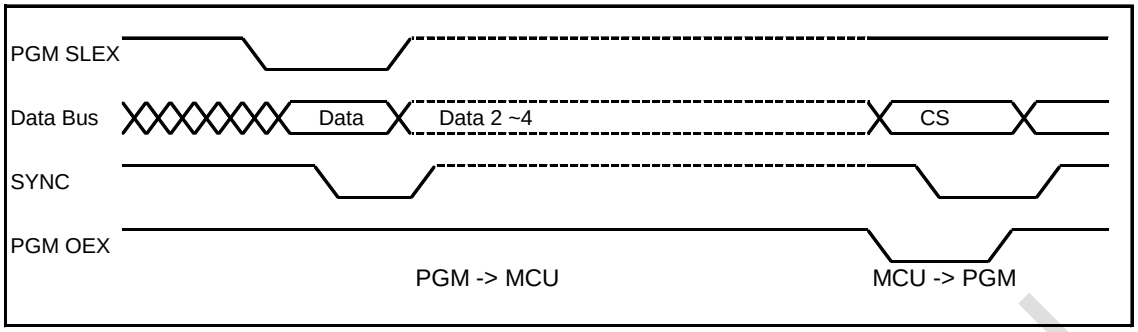


Figure 8–2: Timing of Erase/Read/Write Command send

*1 CMD: Erase(0x55), Read(0x18), Write(0x81).

*2 CS: CheckSum;

CS = Data1+ … + Data4

Example: Command Sending Sequence.

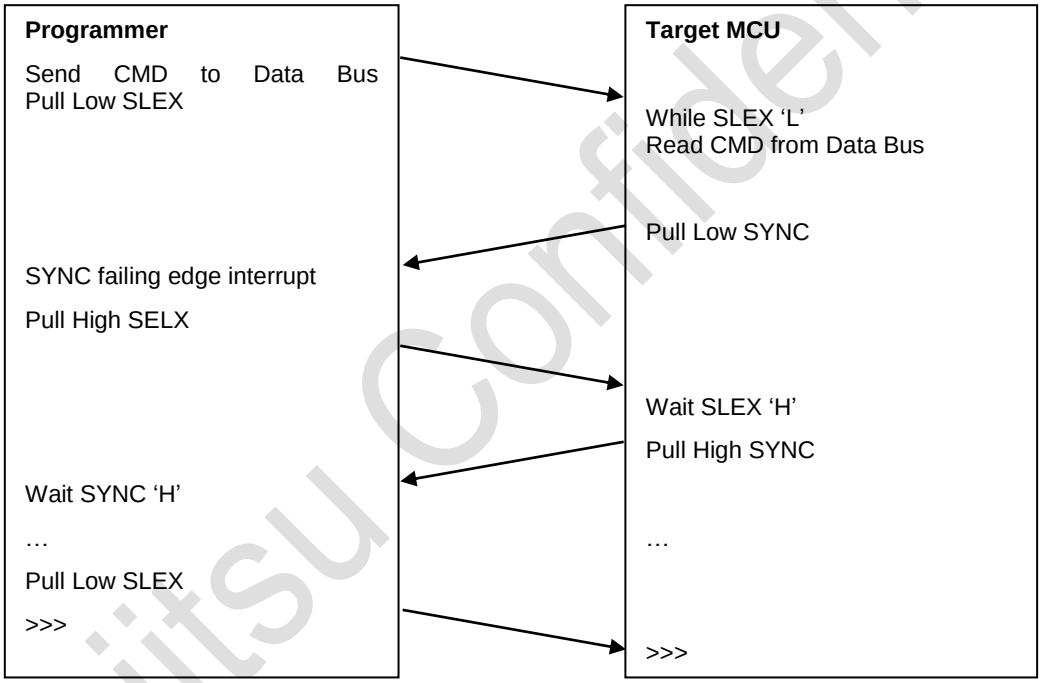


Figure 8–3: Command Sending Sequence

Below example shows how to implement flash chip erase operation:

Send below frame using command sending sequence:

PGM → MCU

0x55, 0x00, 0x00, 0x00, 0x00

```
|          |                   |
|          |                   |
|          |                   |-- Reserve
|          |-- Reserve
|-- Command
```

MCU → PGM

0x55

|-- Check sum by target MCU

8.2 Data Send or Receive Sequence

Here shows Programmer how to send/receive Data to/from Target MCU.

To send one byte data to Target MCU, Programmer must set PORT output; the timing is shown in Figure 8–4.

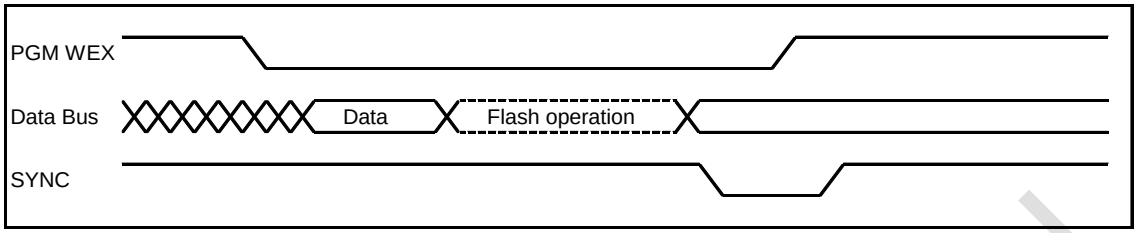


Figure 8–4: Timing of send data

Example: Flash Write Sequence.

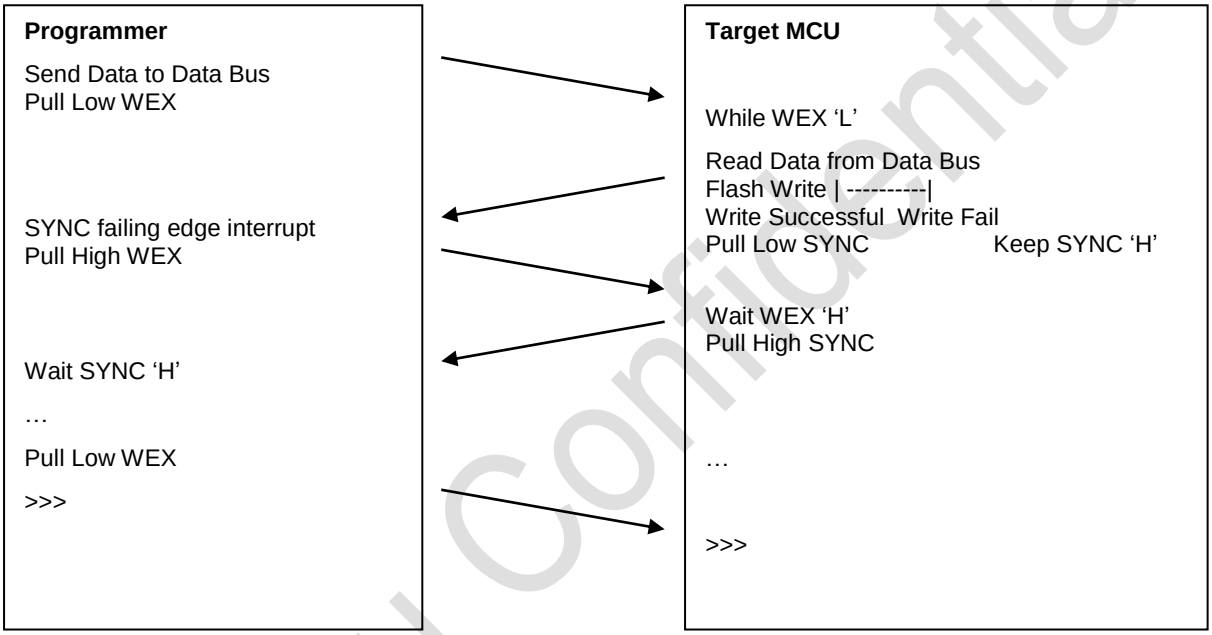


Figure 8–5: Flash Write Sequence

Below example shows the operation how to write 10 bytes data from C000H,

Step 1: send below frame using command sending sequence

PGM → MCU

0x81, 0xC0, 0x00, 0x00, 0x0A

| | | |
| | | |
| | | |-- Length H, L
| | |-- Address H, L
|-- Command

MCU → PGM

0x4B

|-- Check sum by target MCU

Step 2: send below command using flash write sequence

Data1	Interval	Data2	Interval	…	Data10

To receive one byte data from Target MCU, Programmer must set PORT input; the timing is shown in Figure 8–6.

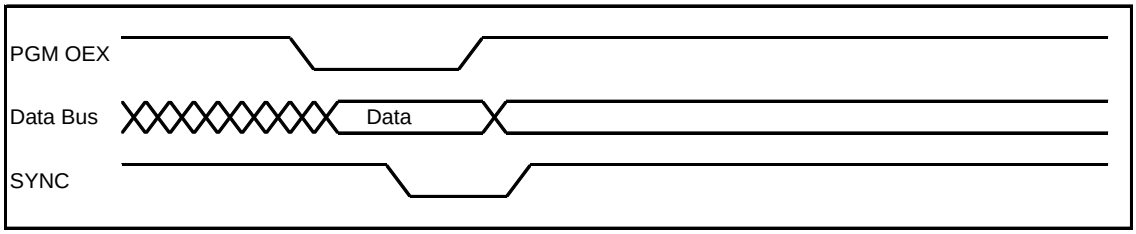


Figure 8–6: Timing of receive data

Flash Read Sequence:

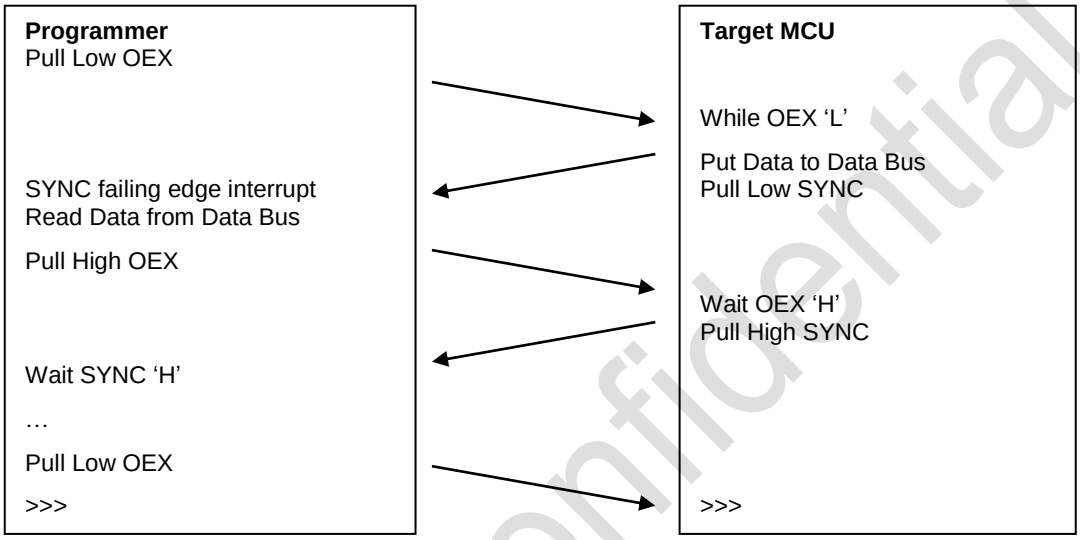


Figure 8–7: Flash Read Sequence

Below example shows the operation how to write 10 bytes data from C000H,

Step 1: send below frame using command sending sequence

PGM → MCU

0x18, 0xC0, 0x00, 0x00, 0x0A

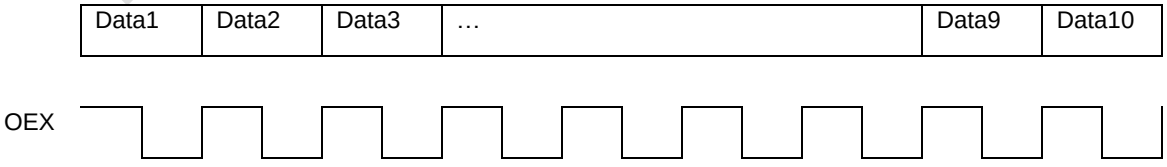
```
|          |                |
|          |                |
|          |                |-- Length H, L
|          |-- Address H, L
|-- Command
```

MCU → PGM

0xE2

|-- Check sum by target MCU

Step 2: generate below timing to complete read operation



* Data is valid while OEX and SYNC are 'L' level

8.3 Erase Flash

Programmer sends Erase Flash command to Target MCU, and then Target MCU implement the command to Erase flash.

Figure 8–8 shows Programmer how to control Target MCU to Erase Flash.

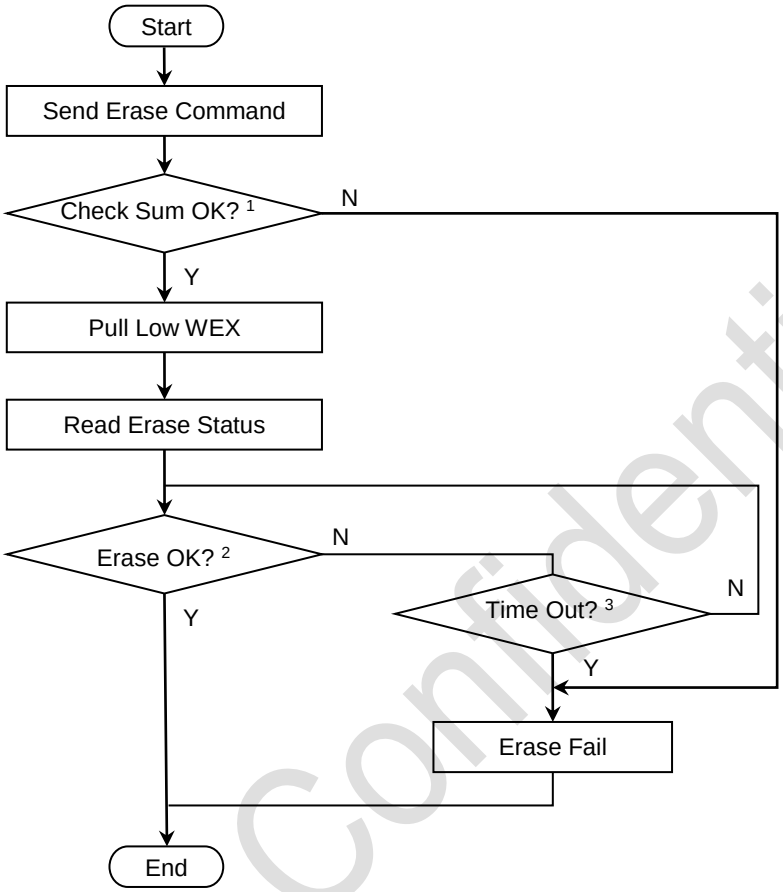


Figure 8–8: Flow Chart of Erase Flash

1. PGM should read check sum after erase command is issued, check sum is send by target MCU (refer to sector 8.1).
2. Check flash erase status by SYNC, SYNC from Low to High indicate flash erase succeed.
3. If flash erase operation time exceed 3 times than typical value (refer to sector 5.2), it indicate that flash ease operation fail.

8.4 Write Flash

Programmer sends Write Flash command to Target MCU, and then Target MCU implement the command to Write flash.

Figure 8–9 shows Programmer how to control Target MCU to Write Flash.

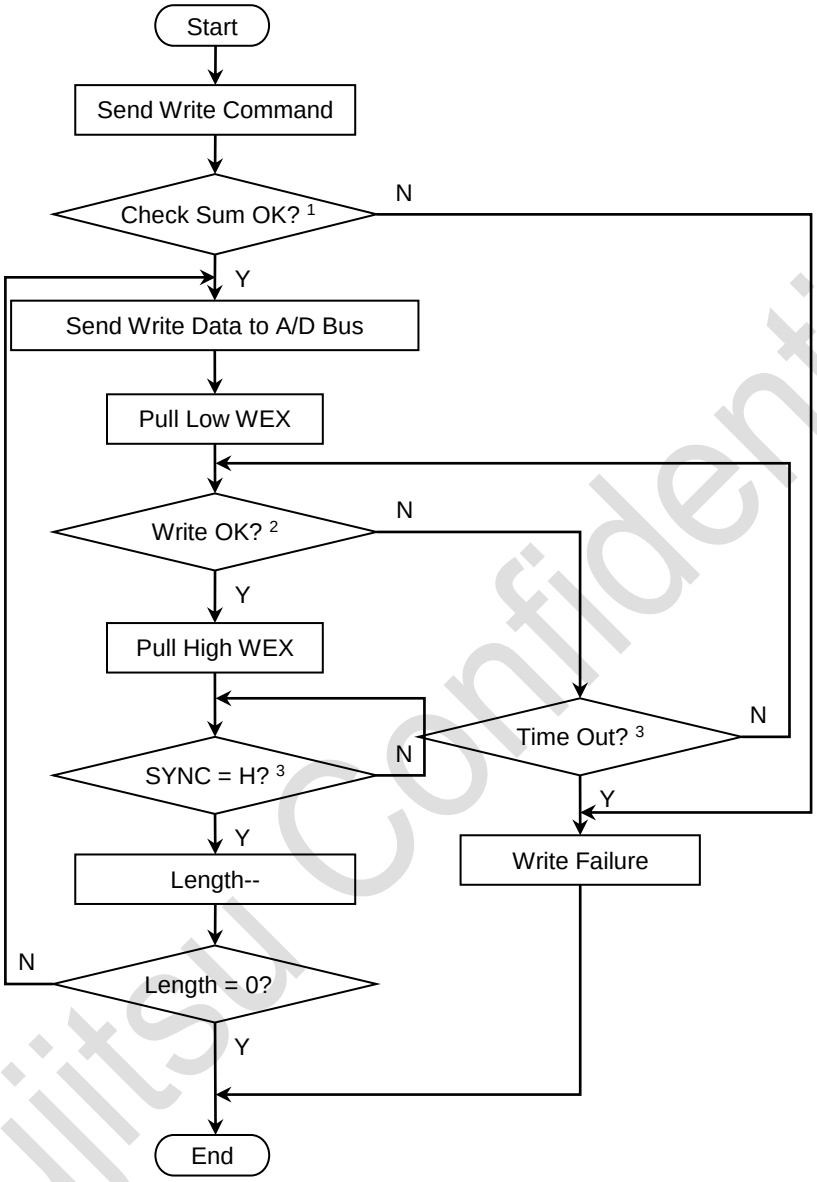


Figure 8–9: Flow Chart of Write Flash

1. PGM should read check sum after write command is issued, check sum is send by target MCU (refer to sector 8.1).
2. Check flash write status by SYNC, SYNC from High to Low indicate flash write succeed.
3. If flash write operation time exceed 3 times than typical value (refer to sector 5.2), it indicate that flash write operation fail.

8.5 Read Flash

Programmer sends Read Flash command to Target MCU, and then Target MCU implement the command to Read flash.

Figure 8–10 shows Programmer how to control Target MCU to Read Flash.

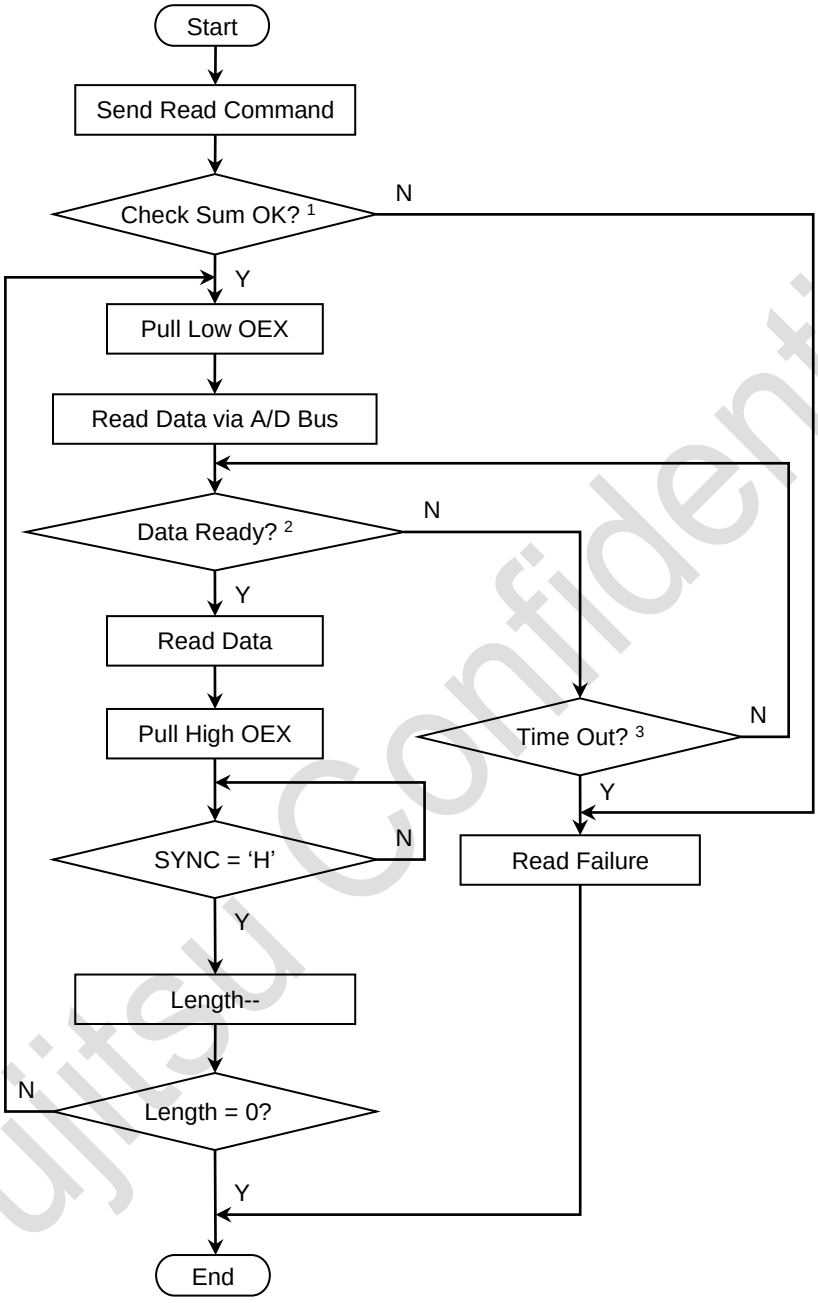


Figure 8–10: Flow Chart of Read Flash

1. PGM should read check sum after read command is issued, check sum is send by target MCU (refer to sector 8.1).
2. Check flash read data if is ready by SYNC, SYNC from High to Low indicate the data is ready to read.
3. If flash read operation time exceed 3 times than typical value (refer to sector 5.2), it indicate that flash read operation fail.

8.6 Blank Check Operation

Blank Check is realized by Read flash memory. If all the read data are blank except 0xFFBB, 0xFFBC and 0xFFBD data, the blank check operation should be passed.

Table 8-1: Blank Check Operation

Address	Bit	Programmer operation
0xFFBB	Bit [7:0]	No need check blank
0xFFBC	Bit [7:0]	No need check blank
0xFFBD	Bit [7:0]	No need check blank
All other flash address	All	Need check blank

8.7 Verify Operation

Verify is realized by Read flash memory. If each read data except 0xFFBB, 0xFFBC and 0xFFBD data equal to the written data, verify operation should be passed.

Table 8-2: Verify Operation

Address	Bit	Programmer operation
0xFFBB	Bit [7:0]	No need check blank
0xFFBC	Bit [7:0]	No need check blank
0xFFBD	Bit [7:0]	No need check blank
All other flash address	All	Need check blank

In mass production, a verify operation should be requested after each write operation to ensure the correct flash write.

9 Flash Security Operation

After initialized flash of target MCU, when writing protection code “0x01” to flash address 0xFFFC, the flash security will not be effective immediately.

In this case, all flash operation will be normal and run correctly. If programmer reads flash address 0xFFFC, the read data should be “0x01”.

The security which is read, write and sector erase operations prohibited will be effective after MCU power reset implemented.

Once flash security is effective, only hand-shake command and chip erase command can be implemented after power-on.

The programmer will received the wrong acknowledge signal “0xFD” (security error) when sector erase and flash initialize commands sent.

The 0xFD received situation can be referred to sector 7.6 and 7.7.

If programmer receives “0xFD” from target MCU, it is recommended for programmer to inform user that “flash security has been enabled; MCU only can be re-programmed after chip erase”.

10 DC Characteristics

The corresponding electrical characteristics information can be found in MCU data sheet, which can be downloaded through the below website.

http://www.fujitsu.com/cn/fss/mcu/mb95/

11 Flash Memory Operation Characteristics

The corresponding electrical characteristics information can be found in MCU data sheet, which can be downloaded through the below website.

http://www.fujitsu.com/cn/fss/mcu/mb95/

11.1 MB95F330/390/430/410/470 Flash Characteristics

Parameter	Value			Unit	Remarks
	Min	Typ	Max		
Sector erase time (2 Kbyte sector)	—	0.2*1	0.5*2	s	The time of writing 00H prior to erasure is excluded.
Sector erase time (16 Kbyte sector)	—	0.5*1	7.5*2	s	The time of writing 00H prior to erasure is excluded.
Byte writing time	—	21	6100*2	µs	System-level overhead is excluded.
Erase/write cycle	100000	—	—	cycle	
Power supply voltage at erase/ write	3.0	—	5.5	V	
Flash memory data retention time	20*3	—	—	year	Average T_A = +85°C

*1: T_A = +25°C, V_{CC} = 5.0 V, 100000 cycles

*2: T_A = +85°C, V_{CC} = 3.0 V, 100000 cycles

*3: This value is converted from the result of a technology reliability assessment. (The value is converted from the result of a high temperature accelerated test using the Arrhenius equation with the average temperature being +85°C).

11.2 MB95F310/370/350 Flash Characteristics

Parameter	Value			Unit	Remarks
	Min	Typ	Max		
Sector erase time (2 Kbyte sector)	—	0.2*1	0.5*2	s	The time of writing 00H prior to erasure is excluded.
Sector erase time (16 Kbyte sector)	—	0.5*1	7.5*2	s	The time of writing 00H prior to erasure is excluded.
Byte writing time	—	21	6100*2	µs	System-level overhead is excluded.
Erase/write cycle	—	100000	—	cycle	
Power supply voltage at erase/ write	2.7	—	3.6	V	
Flash memory data retention time	20*3	—	—	year	Average T_A = +85°C

*1: T_A = +25°C, V_{CC} = 3.0 V, 100000 cycles

*2: T_A = +85°C, V_{CC} = 2.7 V, 10000 cycles

*3: This value is converted from the result of a technology reliability assessment. (The value is converted from the result of a high temperature accelerated test using the Arrhenius equation with the average temperature being +85°C).

11.3 MB95630H Flash Characteristics

Parameter	Value			Unit	Remarks
	Min	Typ	Max		
Sector erase time (2KB sector)	–	0.3*1	1.6*2	s	00_H programming time prior to erasure is excluded.
Sector erase time (32KB sector)	–	0.6*1	3.1*2	s	00_H programming time prior to erasure is excluded.
Byte programming time	–	17	272*2	μs	System-level overhead is excluded.
Erase/program cycle	100,000	–	–	cycle	
Power supply voltage at erase/program	2.4	–	5.5	V	
Flash memory data retention time	20	–	–	year	Average T_A = +85°C, Program/Erase cycle is less than 1000 times.
	10	–	–	year	Average T_A = +85°C, Program/Erase cycle is more than 1001 cycle and less than 10000 cycle
	5	–	–	year	Average T_A = +85°C, Program/Erase cycle is more than 10001 times.

*1: T_A=25°C, Vcc=5.5V, 0 cycle
*2: T_A=85°C, Vcc=2.4V, 100,000 cycles
*4: This value is converted from the result of a technology reliability assessment. (The value is converted from the result of a high temperature accelerated test by using the Arrhenius equation with the average temperature being +85°C).

11.4 MB95650L Flash Characteristics

Parameter	Value			Unit	Remarks
	Min	Typ	Max		
Sector erase time (2 Kbyte sector)	—	0.3*1	1.6*2	s	The time of writing "0x00" prior to erasure is excluded.
Sector erase time (32 Kbyte sector)	—	0.6*1	3.1*2	s	The time of writing "0x00" prior to erasure is excluded.
Byte writing time	—	17	272	μs	System-level overhead is excluded.
Program/erase cycle	100000	—	—	cycle	
Power supply voltage at program/erase	1.8	—	5.5	V	
Flash memory data retention time	20*3	—	—	year	Average T_A = +85°C Number of program/erase cycles: 1000 or below
	10*3	—	—		Average T_A = +85°C Number of program/erase cycles: 1001 to 10000 inclusive
	5*3	—	—		Average T_A = +85°C Number of program/erase cycles: 10001 or above

*1: V_{CC} = 5.5 V, T_A = +25°C, 0 cycle
*2: V_{CC} = 1.8 V, T_A = +85°C, 100000 cycles
*3: These values were converted from the result of a technology reliability assessment. (These values were converted from the result of a high temperature accelerated test using the Arrhenius equation with the average temperature being +85°C.)

11.5 MB95690K Flash Characteristics

Parameter	Value			Unit	Remarks
	Min	Typ	Max		
Sector erase time (2 Kbyte sector)	—	0.3*1	1.6*2	s	The time of writing "0x00" prior to erasure is excluded.
Sector erase time (32 Kbyte sector)	—	0.6*1	3.1*2	s	The time of writing "0x00" prior to erasure is excluded.
Byte writing time	—	17	272	µs	System-level overhead is excluded.
Program/erase cycle	100000	—	—	cycle	
Power supply voltage at program/erase	2.4	—	5.5	V	
Flash memory data retention time	20*3	—	—	year	Average T_A = +85°C Number of program/erase cycles: 1000 or below
	10*3	—	—		Average T_A = +85°C Number of program/erase cycles: 1001 to 10000 inclusive
	5*3	—	—		Average T_A = +85°C Number of program/erase cycles: 10001 or above

*1: V_{CC} = 5.5 V, T_A = +25°C, 0 cycle
*2: V_{CC} = 2.4 V, T_A = +85°C, 100000 cycles
*3: These values were converted from the result of a technology reliability assessment. (These values were converted from the result of a high temperature accelerated test using the Arrhenius equation with the average temperature being +85°C)

11.6 MB95710L Flash Characteristics

Parameter	Value			Unit	Remarks
	Min	Typ	Max		
Sector erase time (2 Kbyte sector)	—	0.3*1	1.6*2	s	The time of writing "0x00" prior to erasure is excluded.
Sector erase time (56 Kbyte sector)	—	0.6*1	3.1*2	s	The time of writing "0x00" prior to erasure is excluded.
Byte writing time	—	17	272	µs	System-level overhead is excluded.
Program/erase cycle	100000	—	—	cycle	
Power supply voltage at program/erase	1.8	—	5.5	V	
Flash memory data retention time	20*3	—	—	year	Average T_A = +85°C Number of program/erase cycles: 1000 or below
	10*3	—	—		Average T_A = +85°C Number of program/erase cycles: 1001 to 10000 inclusive
	5*3	—	—		Average T_A = +85°C Number of program/erase cycles: 10001 or above

*1: V_{CC} = 5.5 V, T_A = +25°C, 0 cycle
*2: V_{CC} = 2.4 V, T_A = +85°C, 100000 cycles
*3: These values were converted from the result of a technology reliability assessment. (These values were converted from the result of a high temperature accelerated test using the Arrhenius equation with the average temperature being +85°C.)

11.7 MB95810L Flash Characteristics

Parameter	Value			Unit	Remarks
	Min	Typ	Max		
Sector erase time (2 Kbyte sector)	—	0.3*1	1.6*2	s	The time of writing "0x00" prior to erasure is excluded.
Sector erase time (32 Kbyte sector)	—	0.6*1	3.1*2	s	The time of writing "0x00" prior to erasure is excluded.
Byte writing time	—	17	272	µs	System-level overhead is excluded.
Program/erase cycle	100000	—	—	cycle	
Power supply voltage at program/erase	2.4	—	5.5	V	
Flash memory data retention time	20*3	—	—	year	Average T_A = +85°C Number of program/erase cycles: 1000 or below
	10*3	—	—		Average T_A = +85°C Number of program/erase cycles: 1001 to 10000 inclusive
	5*3	—	—		Average T_A = +85°C Number of program/erase cycles: 10001 or above

*1: V_{CC} = 5.5 V, T_A = +25°C, 0 cycle
*2: V_{CC} = 2.4 V, T_A = +85°C, 100000 cycles
*3: These values were converted from the result of a technology reliability assessment. (These values were converted from the result of a high temperature accelerated test using the Arrhenius equation with the average temperature being +85°C)

11.8 MB95870K Flash Characteristics

Parameter	Value			Unit	Remarks
	Min	Typ	Max		
Sector erase time (2 Kbyte sector)	—	0.3*1	1.6*2	s	The time of writing "0x00" prior to erasure is excluded.
Sector erase time (32 Kbyte sector)	—	0.6*1	3.1*2	s	The time of writing "0x00" prior to erasure is excluded.
Byte writing time	—	17	272	µs	System-level overhead is excluded.
Program/erase cycle	100000	—	—	cycle	
Power supply voltage at program/erase	2.4	—	5.5	V	
Flash memory data retention time	20*3	—	—	year	Average T_A = +85°C Number of program/erase cycles: 1000 or below
	10*3	—	—		Average T_A = +85°C Number of program/erase cycles: 1001 to 10000 inclusive
	5*3	—	—		Average T_A = +85°C Number of program/erase cycles: 10001 or above

*1: V_{CC} = 5.5 V, T_A = +25°C, 0 cycle
*2: V_{CC} = 2.4 V, T_A = +85°C, 100000 cycles
*3: These values were converted from the result of a technology reliability assessment. (These values were converted from the result of a high temperature accelerated test using the Arrhenius equation with the average temperature being +85°C.)

12 Appendix

12.1 Flash Initialize Data

12.1.1 Flash Initialize data for MB95F330/390/350/310/370 series.

Table 12-1: General Series MCU RAM Data

00	00	00	00	E4	02	7F	E1	60	0F	E4	74	60	61	0F	E4
85	07	XX	85	00	FF	AC	02	85	17	00	AC	03	04	FF	61
0F	C3	60	0F	C5	74	80	61	0F	C5	85	73	3F	85	01	00
E4	01	2C	D0	FC	FD	31	02	64	31	01	A4	60	00	00	45
93	A4	02	B3	16	FD	AC	02	31	01	A4	60	00	00	A4	02
10	B3	16	FD	AC	02	31	01	A4	60	00	00	D5	90	A4	02
B3	16	FD	AC	02	31	01	A4	60	00	00	A4	02	10	B3	16
FD	AC	02	31	01	A4	60	00	00	E3	A4	02	B3	16	FD	AC
02	F3	10	04	00	10	81	22	81	25	93	05	90	81	22	05
91	81	22	85	01	FF	31	01	B2	61	00	00	A4	02	B2	16
FD	AC	02	95	93	55	FD	3A	95	93	18	FD	47	95	93	81
FD	03	21	00	BD	85	01	00	31	02	0A	F3	40	31	01	AB
60	00	00	A4	02	45	92	E6	00	92	C5	90	E3	C0	D5	90
31	02	23	F9	FE	B4	16	FD	AC	02	50	D0	FD	13	E3	21
01	4B	31	01	AB	A4	02	31	01	B9	F9	FB	31	01	ED	AC
02	21	00	BD	31	01	B2	C5	90	92	61	00	00	C5	90	C0
D5	90	A4	02	B2	16	FD	AC	02	D3	F3	E4	00	00	13	FD
E0	21	01	84	BB	16	FD	BB	16	FA	20	BC	16	FD	BC	16
FA	20	BA	16	FD	BA	16	FA	20	E7	CA	AA	E6	C5	54	A9
72	87	AA	86	00	55	87	80	87	AA	86	00	55	87	10	00
00	BC	72	15	07	64	20	FD	F8	BC	72	0D	00	BC	72	09
04	F0	61	FF	00	91	A1	72	20	81	A1	72	20	31	02	0A
E7	FF	BC	E6	0F	E4	06	00	31	02	23	E7	FF	BD	E6	0F
E5	06	00	31	02	23	31	02	64	20	F3	40	41	A9	72	E6
BA	AA	E7	B5	54	86	00	AA	87	55	86	00	20	A1	72	51
50	E3	20	E4	FF	BD	13	FC	0F	06	00	64	60	E6	FF	BC
06	00	64	9F	72	21	02	41	43	E4	FF	BE	13	FD	23	06
00	A9	72	87	A0	47	00	00	BC	72	15	07	64	20	FD	F8
BC	72	0D	00	BC	72	09	04	F0	61	FF	00	91	A1	72	20
A1	72	81	20	41	A9	72	E6	10	00	86	00	90	86	00	00
A1	72	51	20												

XX: could be 0x00 to 0x03

The less the XX, the more the power consumption, the faster the execute speed.

12.1.2 Flash Initialize data for MB95F430 series.

Table 12-2: MB95F430 Series MCU RAM Data

00	00	00	00	E4	02	7F	E1	60	0F	E4	74	60	61	0F	E4
85	07	**XX**	85	17	10	85	3C	05	85	3D	05	E4	FF	FF	61
00	2C	D4	0F	C2	04	80	61	0F	C5	85	73	3F	AC	16	85
01	00	E4	01	2C	D0	FC	FD	31	02	66	31	01	A6	60	00
00	45	93	A4	16	B6	16	FD	AC	16	31	01	A6	60	00	00
A4	16	10	B6	16	FD	AC	16	31	01	A6	60	00	00	D5	90
A4	16	B6	16	FD	AC	16	31	01	A6	60	00	00	A4	16	10
B6	16	FD	AC	16	31	01	A6	60	00	00	E3	A4	16	B6	16
FD	AC	16	F3	10	04	00	10	81	22	81	25	93	05	90	81
22	05	91	81	22	85	01	FF	31	01	B4	61	00	00	A4	16
B7	16	FD	AC	16	95	93	55	FD	3A	95	93	18	FD	47	95
93	81	FD	03	21	00	BF	85	01	00	31	02	0C	F3	40	31
01	AD	60	00	00	A4	16	45	92	E6	00	92	C5	90	E3	C0
D5	90	31	02	25	F9	FE	B5	16	FD	AC	16	50	D0	FD	13
E3	21	01	4D	31	01	AD	A4	16	31	01	BB	F9	FB	31	01
EF	AC	16	21	00	BF	31	01	B4	C5	90	92	61	00	00	C5
90	C0	D5	90	A4	16	B7	16	FD	AC	16	D3	F3	E4	00	00
13	FD	E0	21	01	86	BE	16	FD	BE	16	FA	20	BD	16	FD
BD	16	FA	20	BF	16	FD	BF	16	FA	20	E7	CA	AA	E6	C5
54	A9	72	87	AA	86	00	55	87	80	87	AA	86	00	55	87
10	00	00	BC	72	15	07	64	20	FD	F8	BC	72	0D	00	BC
72	09	04	F0	61	FF	00	91	A1	72	20	81	A1	72	20	31
02	0C	E7	FF	BC	E6	0F	E4	06	00	31	02	25	E7	FF	BD
E6	0F	E5	06	00	31	02	25	31	02	66	20	F3	40	41	A9
72	E6	BA	AA	E7	B5	54	86	00	AA	87	55	86	00	20	A1
72	51	50	E3	20	E4	FF	BD	13	FC	0F	06	00	64	60	E6
FF	BC	06	00	64	9F	72	21	02	43	43	E4	FF	BE	13	FD
23	06	00	A9	72	87	A0	47	00	00	BC	72	15	07	64	20
FD	F8	BC	72	0D	00	BC	72	09	04	F0	61	FF	00	91	A1
72	20	A1	72	81	20	41	A9	72	E6	10	00	86	00	90	86
00	00	A1	72	51	20										

XX: could be 0x00 to 0x03

The less the XX, the more the power consumption, the faster the execute speed.

12.1.3 Flash Initialize data for MB95F410/470 series.

Table 12-3: MB95F410/470 Series MCU RAM Data

00	00	00	00	E4	02	7F	E1	60	0F	E4	74	60	61	0F	E4
85	07	**XX**	85	00	FF	AC	02	85	17	00	AC	03	04	FF	61
0F	AF	60	0F	B2	74	80	61	0F	B2	85	73	3F	85	01	00
E4	01	2C	D0	FC	FD	31	02	64	31	01	A4	60	00	00	45
93	A4	02	B3	16	FD	AC	02	31	01	A4	60	00	00	A4	02
10	B3	16	FD	AC	02	31	01	A4	60	00	00	D5	90	A4	02
B3	16	FD	AC	02	31	01	A4	60	00	00	A4	02	10	B3	16
FD	AC	02	31	01	A4	60	00	00	E3	A4	02	B3	16	FD	AC
02	F3	10	04	00	10	81	22	81	25	93	05	90	81	22	05
91	81	22	85	01	FF	31	01	B2	61	00	00	A4	02	B2	16
FD	AC	02	95	93	55	FD	3A	95	93	18	FD	47	95	93	81
FD	03	21	00	BD	85	01	00	31	02	0A	F3	40	31	01	AB
60	00	00	A4	02	45	92	E6	00	92	C5	90	E3	C0	D5	90
31	02	23	F9	FE	B4	16	FD	AC	02	50	D0	FD	13	E3	21
01	4B	31	01	AB	A4	02	31	01	B9	F9	FB	31	01	ED	AC
02	21	00	BD	31	01	B2	C5	90	92	61	00	00	C5	90	C0
D5	90	A4	02	B2	16	FD	AC	02	D3	F3	E4	00	00	13	FD
E0	21	01	84	BB	16	FD	BB	16	FA	20	BC	16	FD	BC	16
FA	20	BA	16	FD	BA	16	FA	20	E7	CA	AA	E6	C5	54	A9
72	87	AA	86	00	55	87	80	87	AA	86	00	55	87	10	00
00	BC	72	15	07	64	20	FD	F8	BC	72	0D	00	BC	72	09
04	F0	61	FF	00	91	A1	72	20	81	A1	72	20	31	02	0A
E7	FF	BC	E6	0F	E4	06	00	31	02	23	E7	FF	BD	E6	0F
E5	06	00	31	02	23	31	02	64	20	F3	40	41	A9	72	E6
BA	AA	E7	B5	54	86	00	AA	87	55	86	00	20	A1	72	51
50	E3	20	E4	FF	BD	13	FC	0F	06	00	64	60	E6	FF	BC
06	00	64	9F	72	21	02	41	43	E4	FF	BE	13	FD	23	06
00	A9	72	87	A0	47	00	00	BC	72	15	07	64	20	FD	F8
BC	72	0D	00	BC	72	09	04	F0	61	FF	00	91	A1	72	20
A1	72	81	20	41	A9	72	E6	10	00	86	00	90	86	00	00
A1	72	51	20												

XX: could be 0x00 to 0x03

The less the XX, the more the power consumption, the faster the execute speed.

12.1.4 Flash Initialize data for MB95F630 series.

Table 12-4: MB95F630 Series MCU RAM Data

00	00	00	00	E4	02	7F	E1	E4	80	**XX**	D4	00	06	95	07
FC	FC	FB	85	00	FF	AC	02	85	17	00	AC	03	04	FF	61
0F	C3	85	73	3F	85	01	00	E4	01	2C	D0	FC	FD	31	02
59	31	01	9C	60	00	00	45	93	A4	02	B3	16	FD	AC	02
31	01	9C	60	00	00	A4	02	10	B3	16	FD	AC	02	31	01
9C	60	00	00	D5	90	A4	02	B3	16	FD	AC	02	31	01	9C
60	00	00	A4	02	10	B3	16	FD	AC	02	31	01	9C	60	00
00	E3	A4	02	B3	16	FD	AC	02	F3	10	04	00	10	81	22
81	25	93	05	90	81	22	05	91	81	22	85	01	FF	31	01
AA	61	00	00	A4	02	B2	16	FD	AC	02	95	93	55	FD	3A
95	93	18	FD	47	95	93	81	FD	03	21	00	B5	85	01	00
31	02	07	F3	40	31	01	A3	60	00	00	A4	02	45	92	E6
00	92	C5	90	E3	C0	D5	90	31	02	20	F9	FE	B4	16	FD
AC	02	50	D0	FD	13	E3	21	01	43	31	01	A3	A4	02	31
01	B1	F9	FB	31	01	E5	AC	02	21	00	B5	31	01	AA	C5
90	92	61	00	00	C5	90	C0	D5	90	A4	02	B2	16	FD	AC
02	D3	F3	E4	00	00	13	FD	E0	21	01	7C	BB	16	FD	BB
16	FA	20	BC	16	FD	BC	16	FA	20	BA	16	FD	BA	16	FA
20	E7	CA	A8	E6	C5	54	A9	72	87	AA	86	00	55	87	80
87	AA	86	00	55	87	10	00	00	BC	72	15	07	64	20	FD
F8	BC	72	0D	00	BC	72	09	04	F0	61	FF	00	91	A1	72
20	81	A1	72	20	31	02	07	E7	FF	BB	E6	0F	E7	31	02
20	E7	FF	BC	E6	0F	E4	31	02	20	E7	FF	BD	E6	0F	E5
31	02	20	31	02	59	20	F3	40	41	A9	72	E6	BA	A8	E7
B5	54	86	00	AA	87	55	86	00	20	A1	72	51	50	E3	20
E4	FF	BC	13	FD	31	43	E4	FF	BD	13	FD	2A	43	E4	FF
BE	13	FD	23	06	00	A9	72	87	A0	47	00	00	BC	72	15
07	64	20	FD	F8	BC	72	0D	00	BC	72	09	04	F0	61	FF
00	91	A1	72	20	A1	72	81	20	41	A9	72	E6	10	00	86
00	90	86	00	00	A1	72	51	20							

XX: could be 0x1C to 0x1F

The less the XX, the more the power consumption, the faster the execute speed.

12.1.5 Flash Initialize data for MB95F650/690/810 series.

Table 12-5: MB95F650/690/810 Series MCU RAM Data

00	00	00	00	E4	02	7F	E1	E4	80	XX	D4	00	06	95	07
FC	FC	FB	85	00	FF	AC	02	85	17	00	AC	03	04	FF	61
0F	C3	85	73	3F	85	01	00	E4	01	2C	D0	FC	FD	31	02
59	31	01	9C	60	00	00	45	93	A4	02	B3	16	FD	AC	02
31	01	9C	60	00	00	A4	02	10	B3	16	FD	AC	02	31	01
9C	60	00	00	D5	90	A4	02	B3	16	FD	AC	02	31	01	9C
60	00	00	A4	02	10	B3	16	FD	AC	02	31	01	9C	60	00
00	E3	A4	02	B3	16	FD	AC	02	F3	10	04	00	10	81	22
81	25	93	05	90	81	22	05	91	81	22	85	01	FF	31	01
AA	61	00	00	A4	02	B2	16	FD	AC	02	95	93	55	FD	3A
95	93	18	FD	47	95	93	81	FD	03	21	00	B5	85	01	00
31	02	07	F3	40	31	01	A3	60	00	00	A4	02	45	92	E6
00	92	C5	90	E3	C0	D5	90	31	02	20	F9	FE	B4	16	FD
AC	02	50	D0	FD	13	E3	21	01	43	31	01	A3	A4	02	31
01	B1	F9	FB	31	01	E5	AC	02	21	00	B5	31	01	AA	C5
90	92	61	00	00	C5	90	C0	D5	90	A4	02	B2	16	FD	AC
02	D3	F3	E4	00	00	13	FD	E0	21	01	7C	BB	16	FD	BB
16	FA	20	BC	16	FD	BC	16	FA	20	BA	16	FD	BA	16	FA
20	E7	CA	AA	E6	C5	54	A9	72	87	AA	86	00	55	87	80
87	AA	86	00	55	87	10	00	00	BC	72	15	07	64	20	FD
F8	BC	72	0D	00	BC	72	09	04	F0	61	FF	00	91	A1	72
20	81	A1	72	20	31	02	07	E7	FF	BB	E6	0F	E7	31	02
20	E7	FF	BC	E6	0F	E4	31	02	20	E7	FF	BD	E6	0F	E5
31	02	20	31	02	59	20	F3	40	41	A9	72	E6	BA	AA	E7
B5	54	86	00	AA	87	55	86	00	20	A1	72	51	50	E3	20
E4	FF	BC	13	FD	31	43	E4	FF	BD	13	FD	2A	43	E4	FF
BE	13	FD	23	06	00	A9	72	87	A0	47	00	00	BC	72	15
07	64	20	FD	F8	BC	72	0D	00	BC	72	09	04	F0	61	FF
00	91	A1	72	20	A1	72	81	20	41	A9	72	E6	10	00	86
00	90	86	00	00	A1	72	51	20							

XX: could be 0x1C to 0x1F

The less the XX, the more the power consumption, the faster the execute speed.

12.1.6 Flash Initialize data for MB95F710 series.

Table 12-6: MB95F710 Series MCU RAM Data

00	00	00	00	E4	02	8F	E1	E4	80	**XX**	D4	00	06	95	07
FC	FC	FB	85	00	FF	AC	02	04	FF	61	0F	AF	04	80	61
0F	B2	85	17	00	AC	03	04	FF	61	0F	AF	85	73	3F	85
01	00	E4	01	2C	D0	FC	FD	31	02	63	31	01	A6	60	00
00	45	93	A4	02	B3	16	FD	AC	02	31	01	A6	60	00	00
A4	02	10	B3	16	FD	AC	02	31	01	A6	60	00	00	D5	90
A4	02	B3	16	FD	AC	02	31	01	A6	60	00	00	A4	02	10
B3	16	FD	AC	02	31	01	A6	60	00	00	E3	A4	02	B3	16
FD	AC	02	F3	10	04	00	10	81	22	81	25	93	05	90	81
22	05	91	81	22	85	01	FF	31	01	B4	61	00	00	A4	02
B2	16	FD	AC	02	95	93	55	FD	3A	95	93	18	FD	47	95
93	81	FD	03	21	00	BF	85	01	00	31	02	11	F3	40	31
01	AD	60	00	00	A4	02	45	92	E6	00	92	C5	90	E3	C0
D5	90	31	02	2A	F9	FE	B4	16	FD	AC	02	50	D0	FD	13
E3	21	01	4D	31	01	AD	A4	02	31	01	BB	F9	FB	31	01
EF	AC	02	21	00	BF	31	01	B4	C5	90	92	61	00	00	C5
90	C0	D5	90	A4	02	B2	16	FD	AC	02	D3	F3	E4	00	00
13	FD	E0	21	01	86	BB	16	FD	BB	16	FA	20	BC	16	FD
BC	16	FA	20	BA	16	FD	BA	16	FA	20	E7	CA	AA	E6	C5
54	A9	72	87	AA	86	00	55	87	80	87	AA	86	00	55	87
10	00	00	BC	72	15	07	64	20	FD	F8	BC	72	0D	00	BC
72	09	04	F0	61	FF	00	91	A1	72	20	81	A1	72	20	31
02	11	E7	FF	BB	E6	0F	E7	31	02	2A	E7	FF	BC	E6	0F
E4	31	02	2A	E7	FF	BD	E6	0F	E5	31	02	2A	31	02	63
20	F3	40	41	A9	72	E6	BA	AA	E7	B5	54	86	00	AA	87
55	86	00	20	A1	72	51	50	E3	20	E4	FF	BC	13	FD	31
43	E4	FF	BD	13	FD	2A	43	E4	FF	BE	13	FD	23	06	00
A9	72	87	A0	47	00	00	BC	72	15	07	64	20	FD	F8	BC
72	0D	00	BC	72	09	04	F0	61	FF	00	91	A1	72	20	A1
72	81	20	41	A9	72	E6	10	00	86	00	90	86	00	00	A1
72	51	20													

XX: could be 0x1C to 0x1F

The less the XX, the more the power consumption, the faster the execute speed.

12.1.7 Flash Initialize data for MB95F870 series.

Table 12-7: MB95F870 Series MCU RAM Data

00	00	00	00	E4	04	7F	E1	E4	80	**XX**	D4	00	06	95	07
FC	FC	FB	85	00	FF	AC	02	04	FF	61	0F	C3	04	FF	61
0F	C0	85	17	00	AC	03	04	FF	61	0F	C3	85	73	3F	85
01	00	E4	01	2C	D0	FC	FD	31	02	63	31	01	A6	60	00
00	45	93	A4	02	B3	16	FD	AC	02	31	01	A6	60	00	00
A4	02	10	B3	16	FD	AC	02	31	01	A6	60	00	00	D5	90
A4	02	B3	16	FD	AC	02	31	01	A6	60	00	00	A4	02	10
B3	16	FD	AC	02	31	01	A6	60	00	00	E3	A4	02	B3	16
FD	AC	02	F3	10	04	00	10	81	22	81	25	93	05	90	81
22	05	91	81	22	85	01	FF	31	01	B4	61	00	00	A4	02
B2	16	FD	AC	02	95	93	55	FD	3A	95	93	18	FD	47	95
93	81	FD	03	21	00	BF	85	01	00	31	02	11	F3	40	31
01	AD	60	00	00	A4	02	45	92	E6	00	92	C5	90	E3	C0
D5	90	31	02	2A	F9	FE	B4	16	FD	AC	02	50	D0	FD	13
E3	21	01	4D	31	01	AD	A4	02	31	01	BB	F9	FB	31	01
EF	AC	02	21	00	BF	31	01	B4	C5	90	92	61	00	00	C5
90	C0	D5	90	A4	02	B2	16	FD	AC	02	D3	F3	E4	00	00
13	FD	E0	21	01	86	BB	16	FD	BB	16	FA	20	BC	16	FD
BC	16	FA	20	BA	16	FD	BA	16	FA	20	E7	CA	AA	E6	C5
54	A9	72	87	AA	86	00	55	87	80	87	AA	86	00	55	87
10	00	00	BC	72	15	07	64	20	FD	F8	BC	72	0D	00	BC
72	09	04	F0	61	FF	00	91	A1	72	20	81	A1	72	20	31
02	11	E7	FF	BB	E6	0F	E7	31	02	2A	E7	FF	BC	E6	0F
E4	31	02	2A	E7	FF	BD	E6	0F	E5	31	02	2A	31	02	63
20	F3	40	41	A9	72	E6	BA	AA	E7	B5	54	86	00	AA	87
55	86	00	20	A1	72	51	50	E3	20	E4	FF	BC	13	FD	31
43	E4	FF	BD	13	FD	2A	43	E4	FF	BE	13	FD	23	06	00
A9	72	87	A0	47	00	00	BC	72	15	07	64	20	FD	F8	BC
72	0D	00	BC	72	09	04	F0	61	FF	00	91	A1	72	20	A1
72	81	20	41	A9	72	E6	10	00	86	00	90	86	00	00	A1
72	51	20													

XX: could be 0x1C to 0x1F

The less the XX, the more the power consumption, the faster the execute speed.

12.2 List of Figures and Tables