

F²MC-8FX FAMILY

8-BIT MICROCONTROLLER

ALL SERIES

NEW 8FX MCU FLASH SERIAL PROGRAMMING

SPECIFICATION



Revision History

Version	Date	Updated by	Modifications
1.0.0	8/18/2011	Levi Zhang	Unify document format and create a new spec (this document)
1.0.1	9/20/2011	Chamber Teng	Modify recommended interval time between each byte; Add baud rate settings of MB95F636H; Modify memory address.
1.1.0	1/10/2012	Levi Zhang	Add website information for MB95560H, MB95630H series MCU
1.1.1	2/20/2012	Levi Zhang	Add MB95F690 series information (Preliminary version)
1.1.2	4/5/2012	Levi Zhang	Add MB95F870 series information (Preliminary version)
1.1.3	5/21/2012	Levi Zhang	Add MB95F650 series information (Preliminary version)
1.1.4	5/31/2012	Amy Qian	Add MB95F710 series and MB95F770 series information (Preliminary version)
1.1.5	8/1/2012	Amy Qian	Modify the Table7-1 and website address Modify the chapter7.10 and 7.11 Add MB95F810 series
1.1.6	8/27/2012	Amy Qian	Modify the Table7-1
1.1.7	12/5/2013	Levi Zhang	Add MB95F710/770J/M series
1.2.0	12/24/2013	Levi Zhang	Revise document Logo, MCU Package information according to the latest DS, download link.
1.2.1	1/7/2014	Levi Zhang	Revise typo
1.3.0	3/15/2017	Amy Qian	Modify 7.9 Recommend Programming Flow Chart Modify the BIN CODE and add erase command after flash initialize command Add Write CR Trimming Command after flash initialize command

This manual contains 59 pages.



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1 Introduction

This specification defines the principle of New 8FX MCU serial programming for programmer supplier.

The below products are supported:

MB95F200H/210H/220H series

MB95F260H/270H/280H series

MB95F330H series

MB95F390H series

MB95F310L/370L series

MB95F350L series

MB95F430H series

MB95F410H/470H series

MB95F560H/570H/580H series

MB95F630H series

MB95F690K series

MB95F650L series

MB95F710L/710M/770L/770M series

MB95F810K series

MB95F870K series

Preliminary

2 MCU Packages

2.1 MB95F200H/210H/220H Series Packages

Part number Package	MB95 F204H	MB95 F203H	MB95 F202H	MB95 F204K	MB95 F203K	MB95 F202K	MB95 F214H	MB95 F213H	MB95 F212H	MB95 F214K	MB95 F213K	MB95 F212K
20-pin plastic SOP	O	O	O	O	O	O	X	X	X	X	X	X
8-pin plastic DIP	X	X	X	X	X	X	O	O	O	O	O	O
8-pin plastic SOP	X	X	X	X	X	X	O	O	O	O	O	O

O: Available

X: Unavailable

Part number Package	MB95F223H	MB95F222H	MB95F223K	MB95F222K
DIP-16P-M06	O	O	O	O
FPT-16P-M06	O	O	O	O

O: Available

2.2 MB95F260H/270H/280H Series Packages

Part number Package	MB95F 262H	MB95F 262K	MB95F 263H	MB95F 263K	MB95F 264H	MB95F 264K	MB95F 272H	MB95F 272K	MB95F 273H	MB95F 273K	MB95F 274H	MB95F 274K
DIP-24P-M07	O	O	O	O	O	O	X	X	X	X	X	X
FPT-20P-M09	O	O	O	O	O	O	X	X	X	X	X	X
FPT-20P-M10	O	O	O	O	O	O	X	X	X	X	X	X
DIP-16P-M06	X	X	X	X	X	X	X	X	X	X	X	X
FPT-16P-M06	X	X	X	X	X	X	X	X	X	X	X	X
DIP-8P-M03	X	X	X	X	X	X	O	O	O	O	O	O
FPT-8P-M08	X	X	X	X	X	X	O	O	O	O	O	O
LCC-32P-M19	O	O	O	O	O	O	X	X	X	X	X	X

Part number Package	MB95F 282H	MB95F 282K	MB95F 283H	MB95F 283K	MB95F 284H	MB95F 284K
DIP-24P-M07	X	X	X	X	X	X
FPT-20P-M09	X	X	X	X	X	X
FPT-20P-M10	X	X	X	X	X	X
DIP-16P-M06	O	O	O	O	O	O
FPT-16P-M06	O	O	O	O	O	O
DIP-8P-M03	X	X	X	X	X	X
FPT-8P-M08	X	X	X	X	X	X
LCC-32P-M19	O	O	O	O	O	O

O: Available

X: Unavailable

2.3 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

2.4 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

2.5 MB95F310L/370L Series Packages

Part number Package	MB95F314E	MB95F316E	MB95F318E	MB95F314L	MB95F316L	MB95F318L	MB95F318
FPT-80P-M21				O			
FPT-80P-M37				O			
FPT-64P-M23				X			
FPT-64P-M24				X			
FPT-64P-M38				X			

Part number Package	MB95F374E	MB95F376E	MB95F378E	MB95F374L	MB95F376L	MB95F378L
FPT-80P-M21			X			
FPT-80P-M37			X			
FPT-64P-M23			O			
FPT-64P-M24			O			
FPT-64P-M38			O			

O: Available
X: Unavailable

2.6 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

2.7 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

2.8 MB95F410H Series Packages

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

O: Available

2.9 MB95F470H Series Packages

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

O: Available

2.10 MB95F560/570/580H Series Packages

• MB95560H Series

Part number Package	MB95F562H	MB95F562K	MB95F563H	MB95F563K	MB95F564H	MB95F564K
LCC-32P-M19	○	○	○	○	○	○
FPT-20P-M09	○	○	○	○	○	○
FPT-20P-M10	○	○	○	○	○	○
FPT-16P-M08	X	X	X	X	X	X
FPT-16P-M23	X	X	X	X	X	X
FPT-8P-M08	X	X	X	X	X	X

• MB95570H Series

Part number Package	MB95F572H	MB95F572K	MB95F573H	MB95F573K	MB95F574H	MB95F574K
LCC-32P-M19	X	X	X	X	X	X
FPT-20P-M09	X	X	X	X	X	X
FPT-20P-M10	X	X	X	X	X	X
FPT-16P-M08	X	X	X	X	X	X
FPT-16P-M23	X	X	X	X	X	X
FPT-8P-M08	○	○	○	○	○	○

• MB95580H Series

Part number Package	MB95F582H	MB95F582K	MB95F583H	MB95F583K	MB95F584H	MB95F584K
LCC-32P-M19	○	○	○	○	○	○
FPT-20P-M09	X	X	X	X	X	X
FPT-20P-M10	X	X	X	X	X	X
FPT-16P-M08	○	○	○	○	○	○
FPT-16P-M23	○	○	○	○	○	○
FPT-8P-M08	X	X	X	X	X	X

O: Available
X: Unavailable

2.11 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

2.12 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

2.13 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

2.14 MB95F710L/710M Series Packages

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

O: Available

2.15 MB95F770L/770M Series Packages

Part number Package	MB95F774E	MB95F776E	MB95F778E	MB95F774L	MB95F776L	MB95F778L
FPT-64P-M38	O	O	O	O	O	O
FPT-64P-M39	O	O	O	O	O	O

O: Available

2.16 MB95F810K Series Packages

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

O: Available

2.17 MB95F870K Series Packages

■ PACKAGES AND CORRESPONDING PRODUCTS

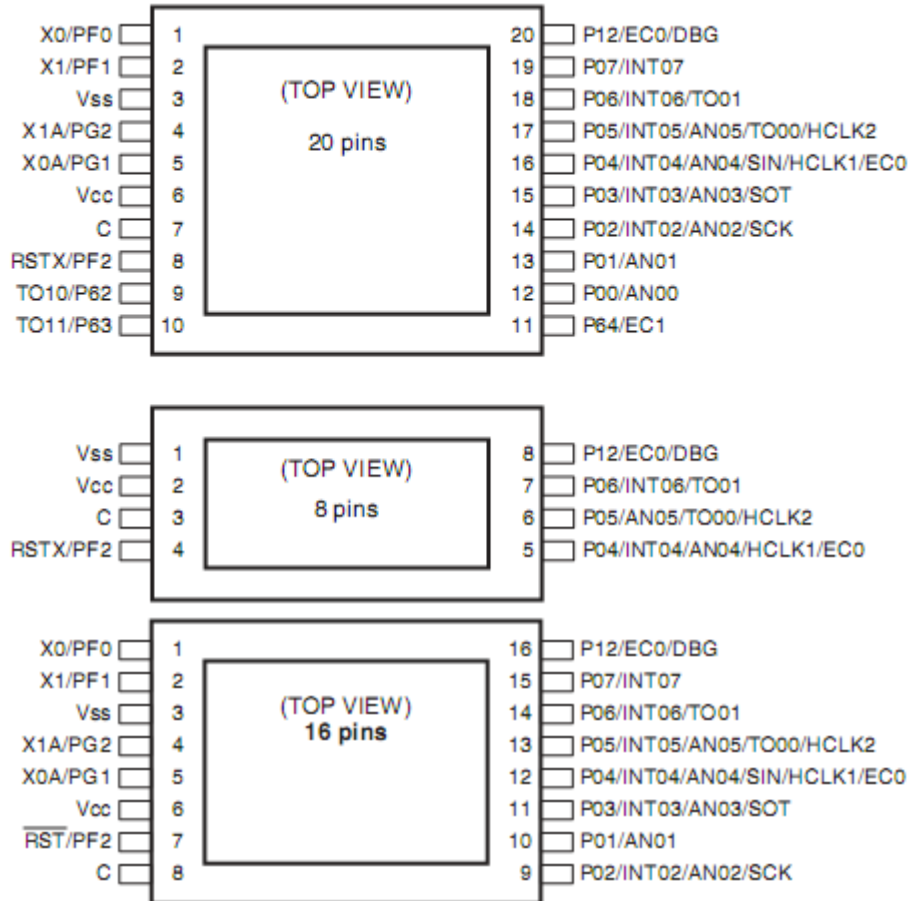
Part number Package	MB95F856K	MB95F866K	MB95F876K
FPT-24P-M10	O	X	X
FPT-24P-M34	O	X	X
FPT-32P-M30	X	O	X
FPT-48P-M49	X	X	O
FPT-52P-M02	X	X	O

O: Available

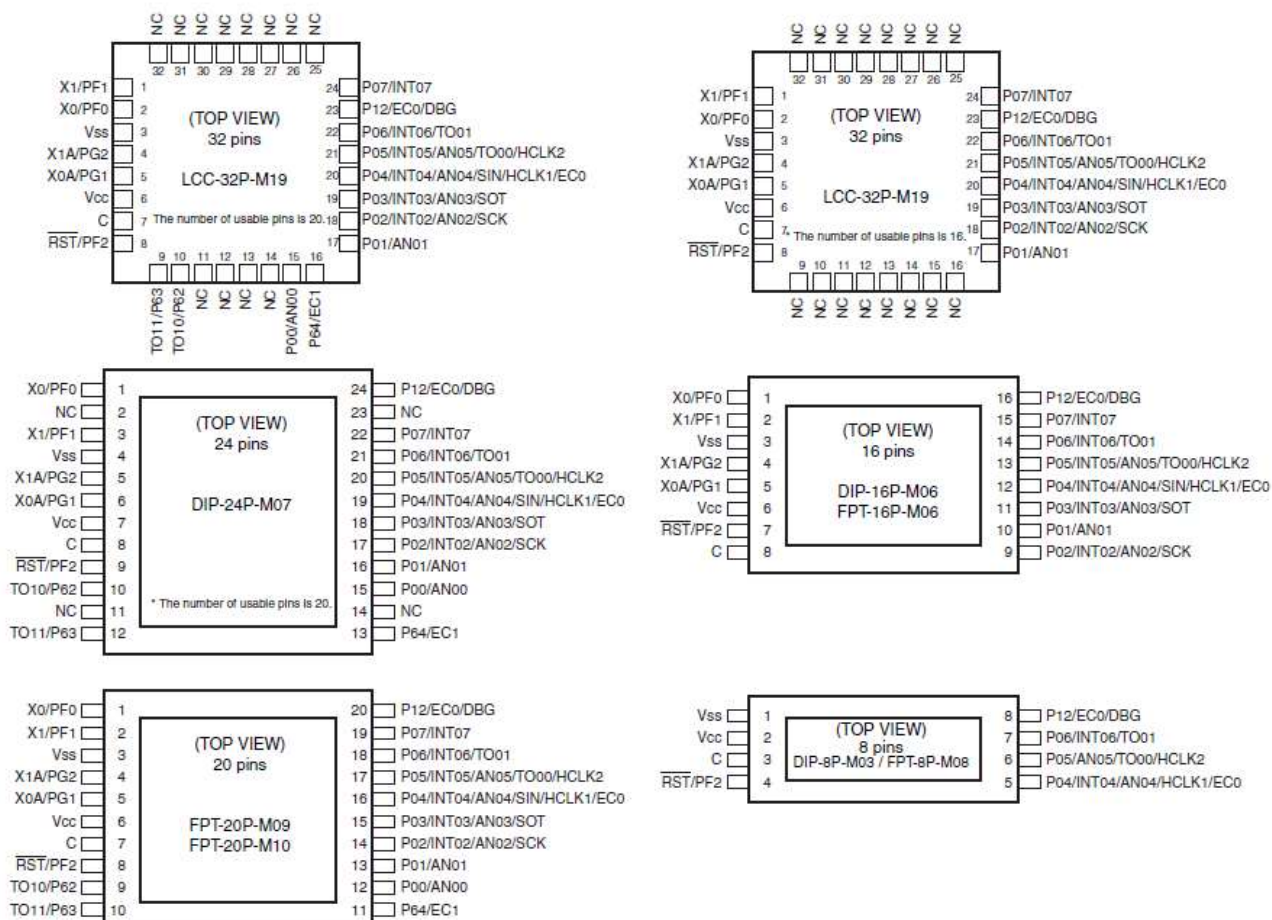
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3 MCU Pin Assignments

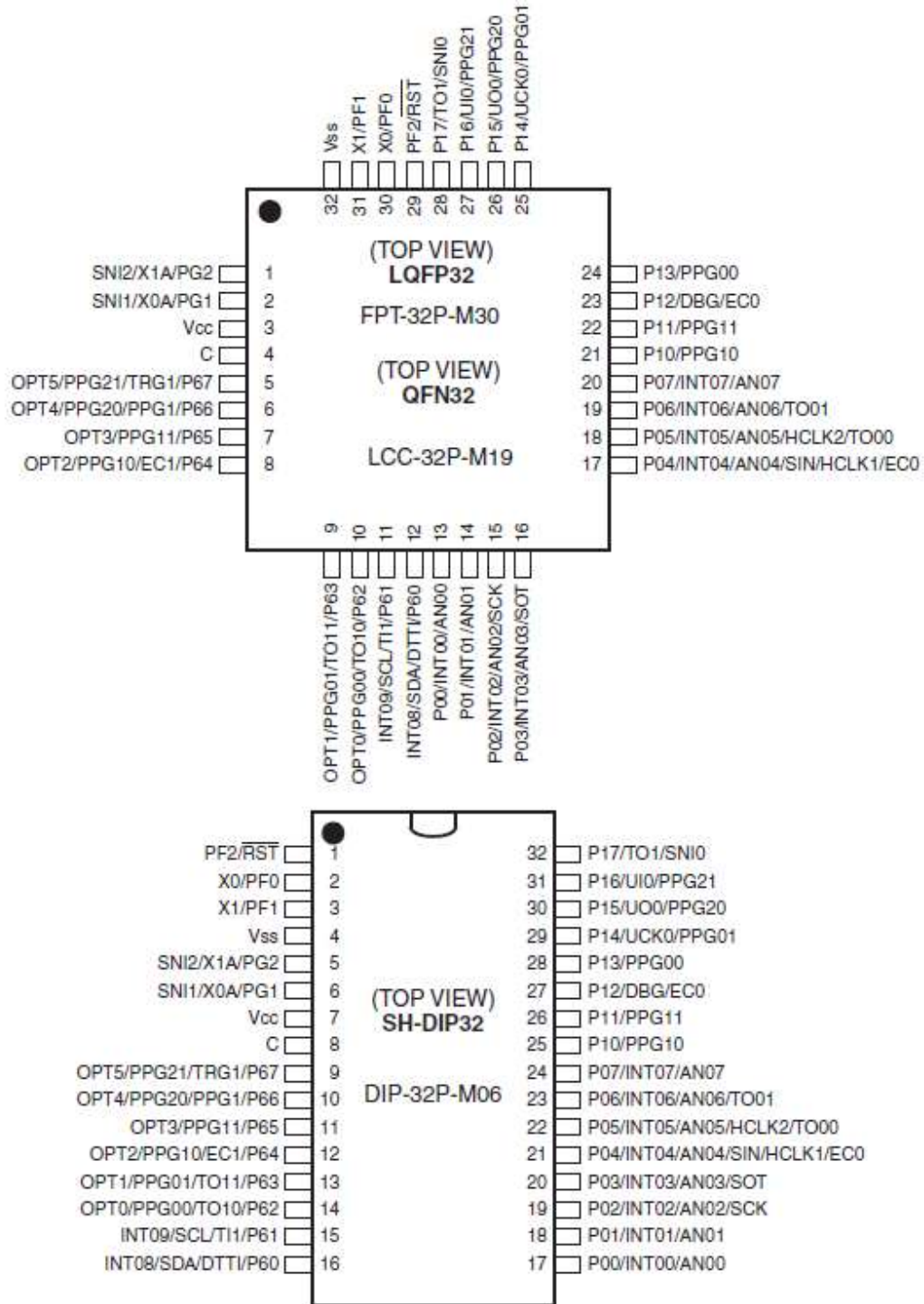
3.1 MB95F200H/210H/220H Series Pin Assignments



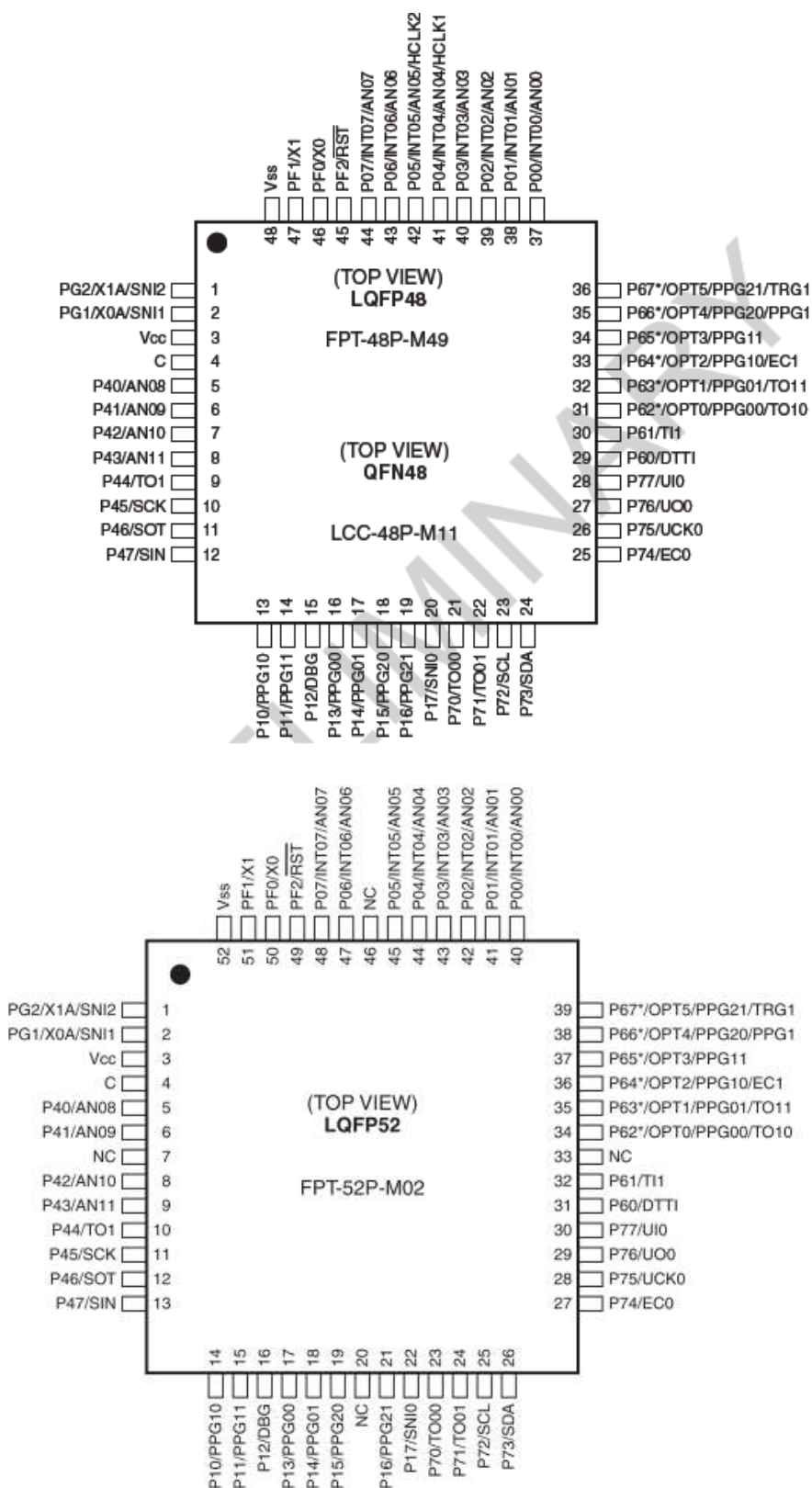
3.2 MB95F260H/270H/280H Series Pin Assignments



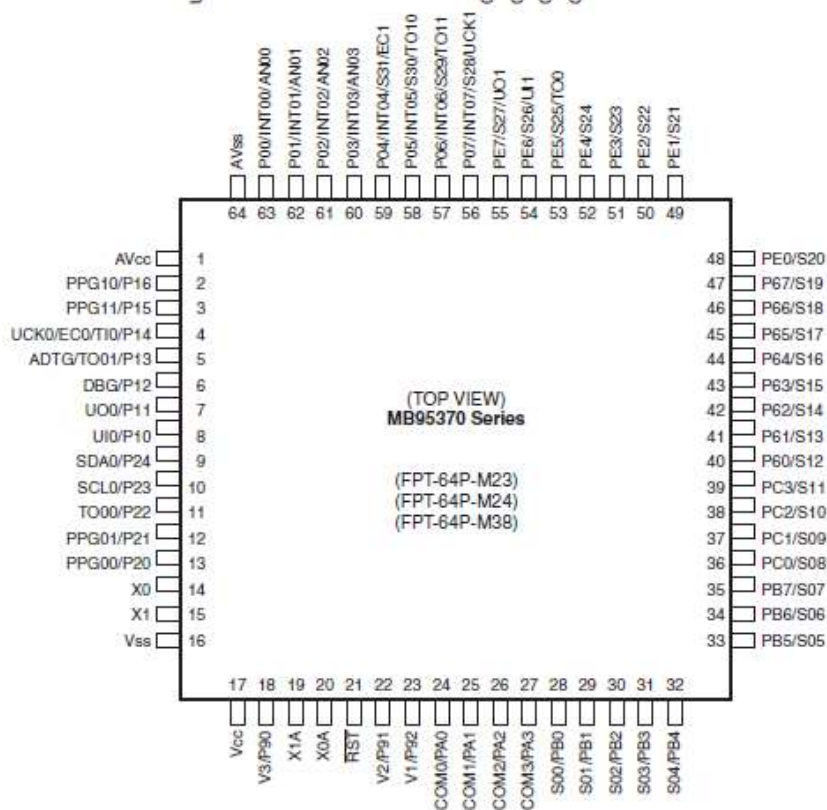
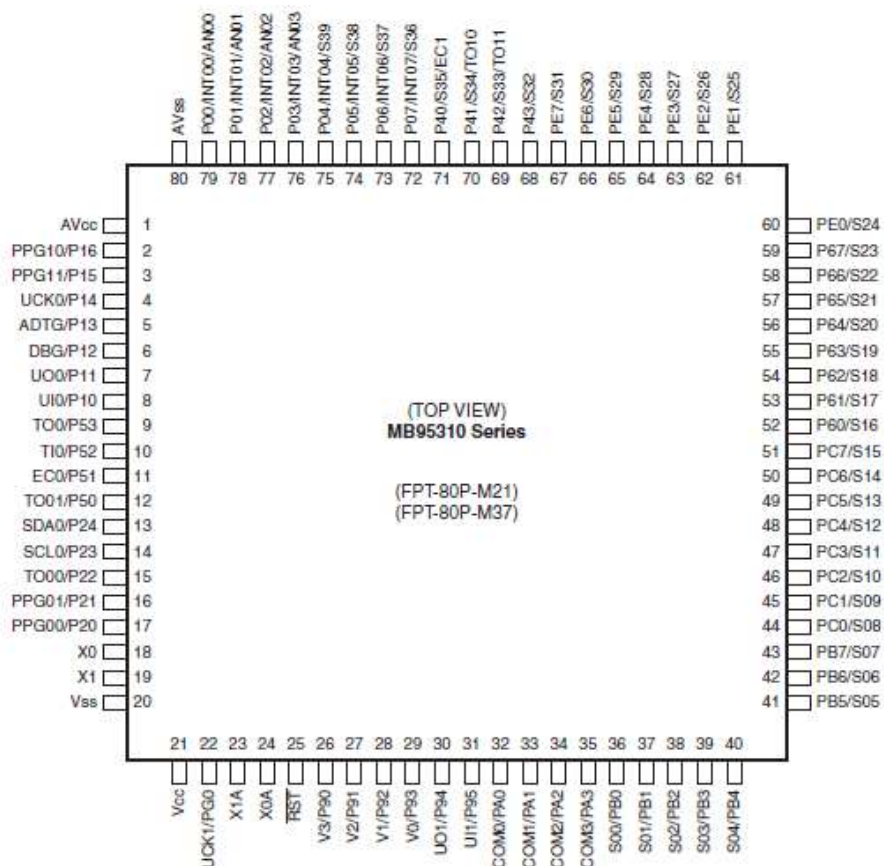
3.3 MB95F330H Series Pin Assignments



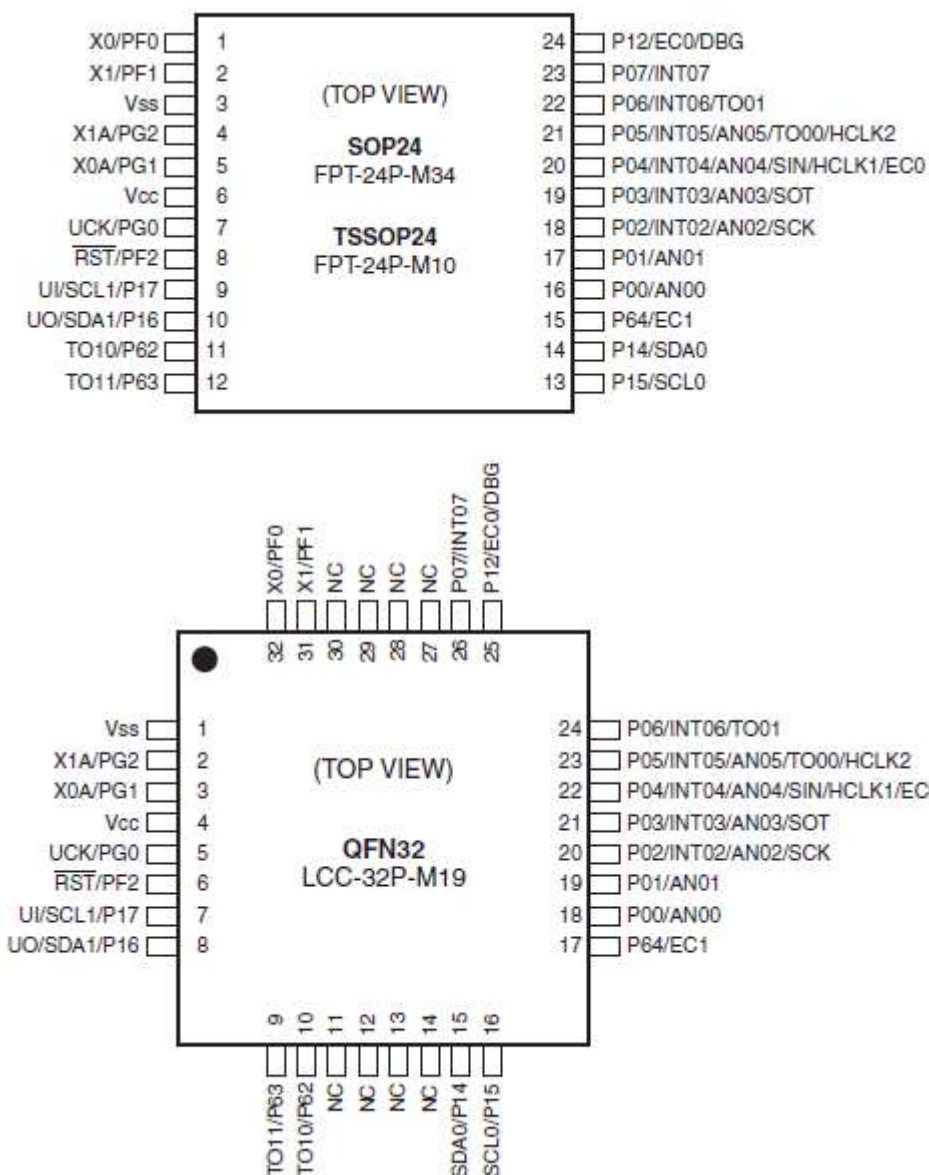
3.4 MB95F390H Series Pin Assignments



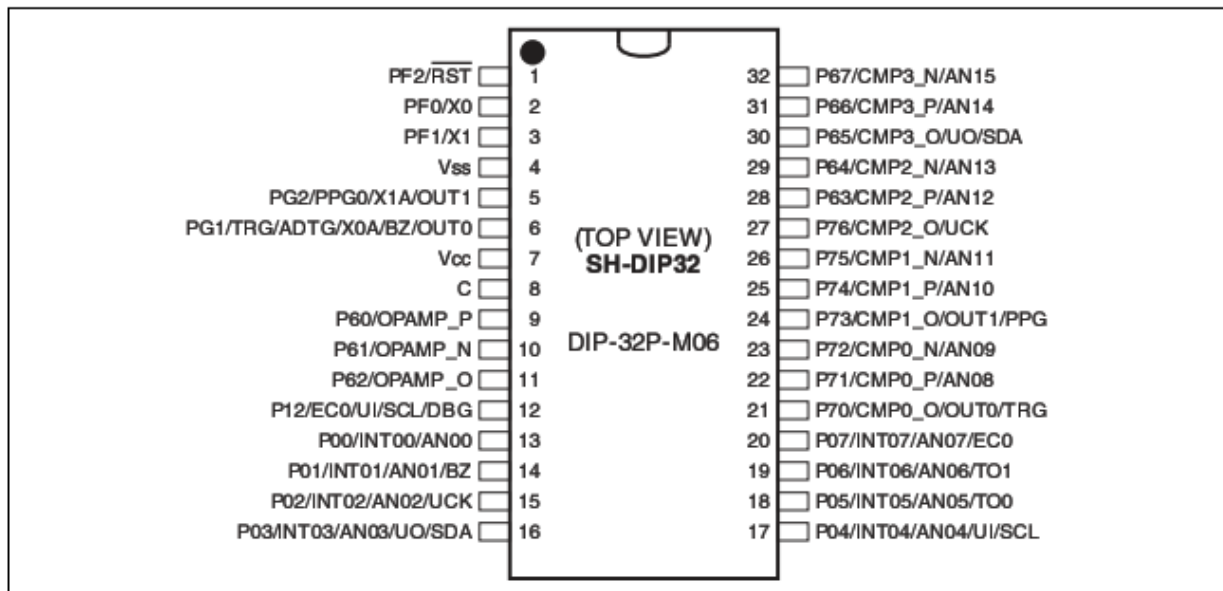
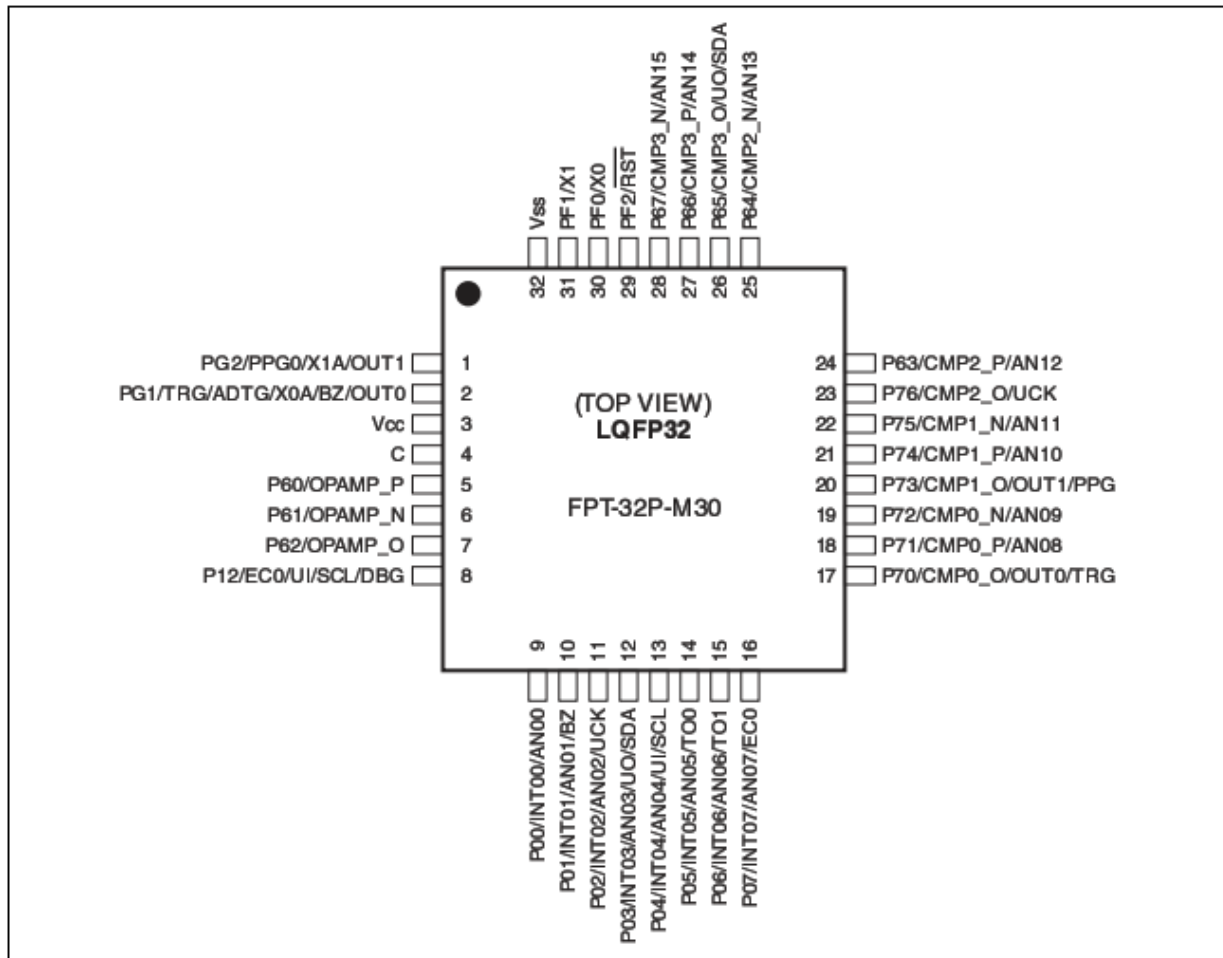
3.5 MB95F310L/370L Series Pin Assignments



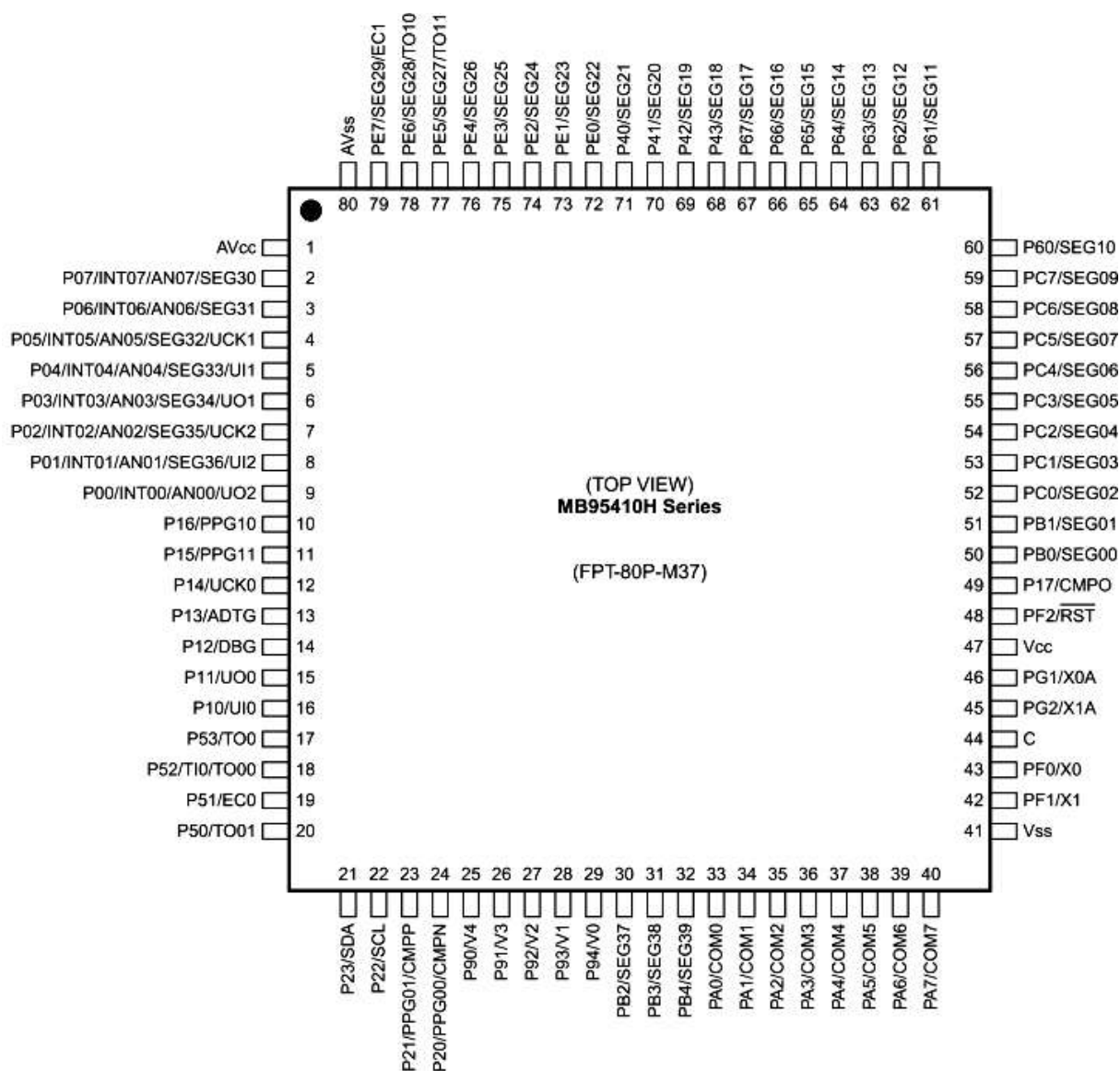
3.6 MB95F350L Series Pin Assignments



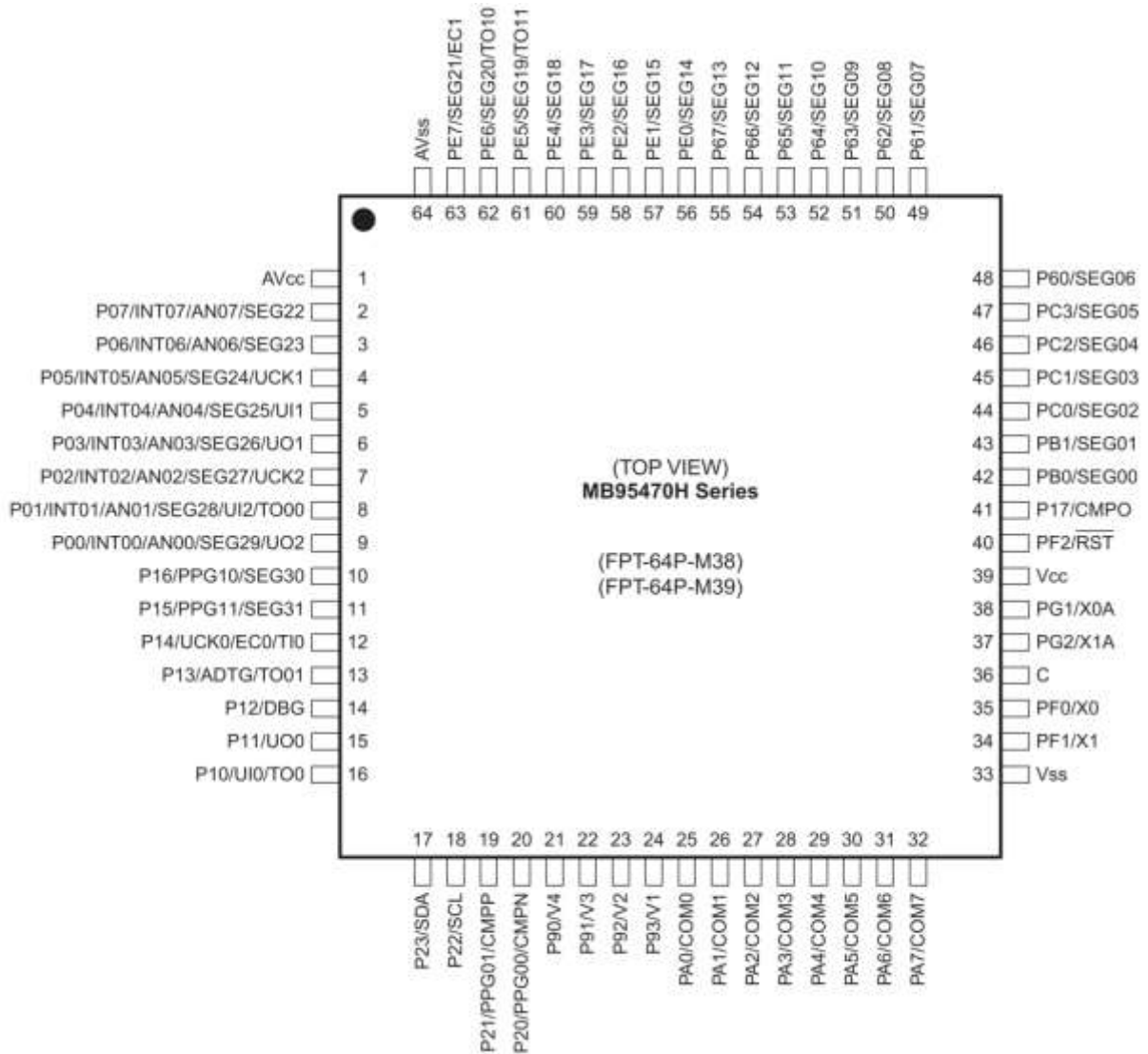
3.7 MB95F430H Series Pin Assignments



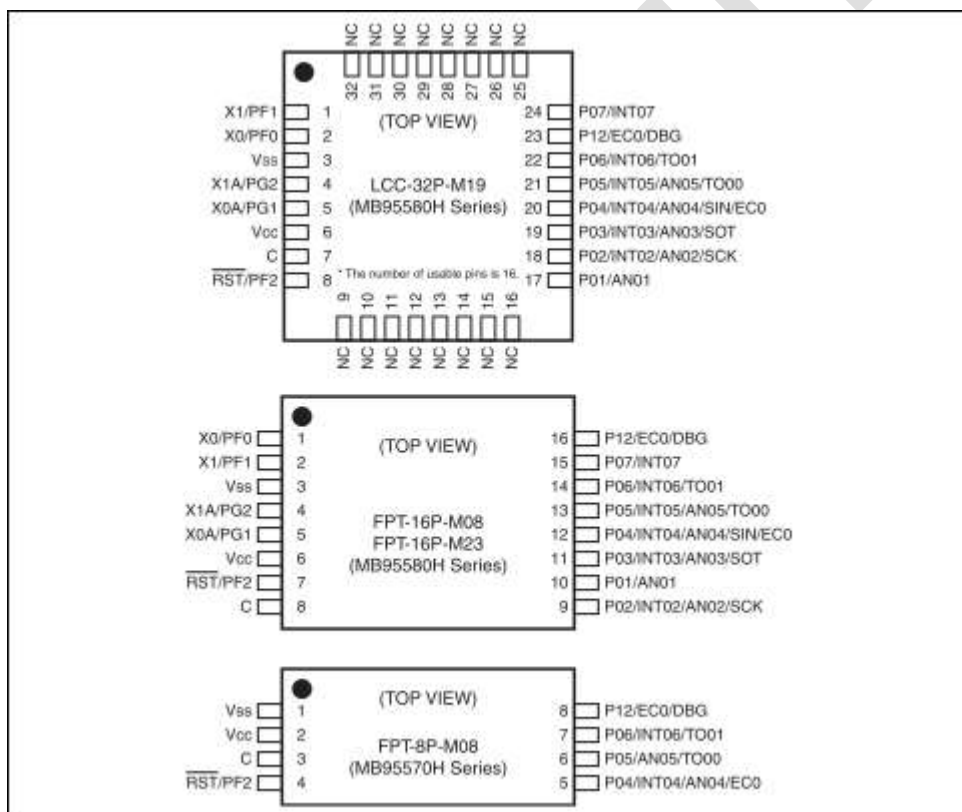
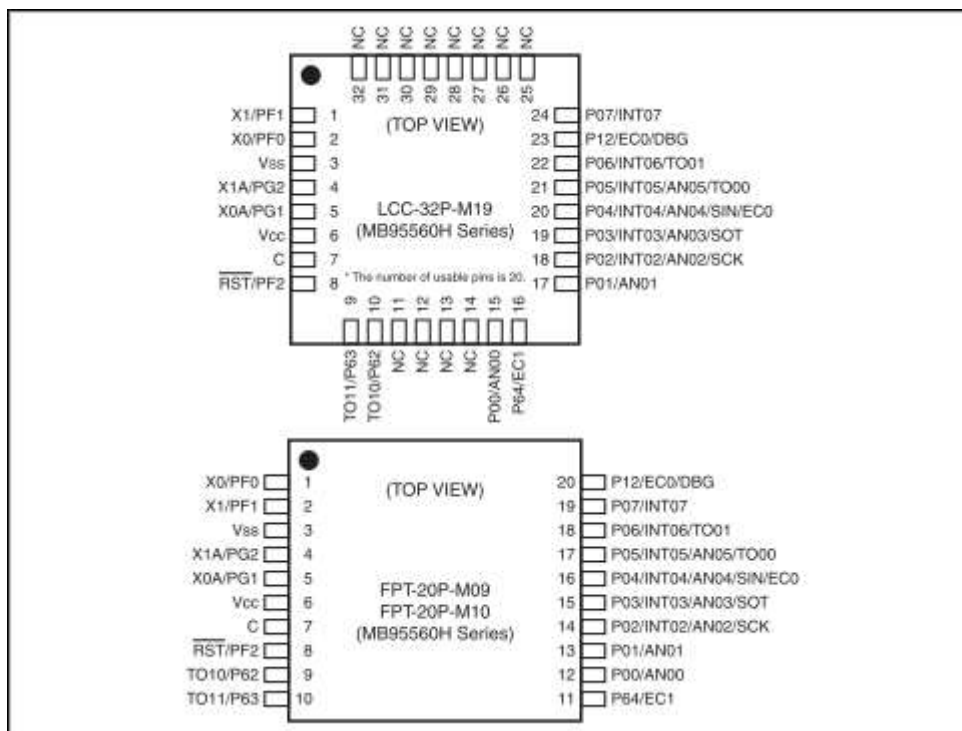
3.8 MB95F410H Series Pin Assignments



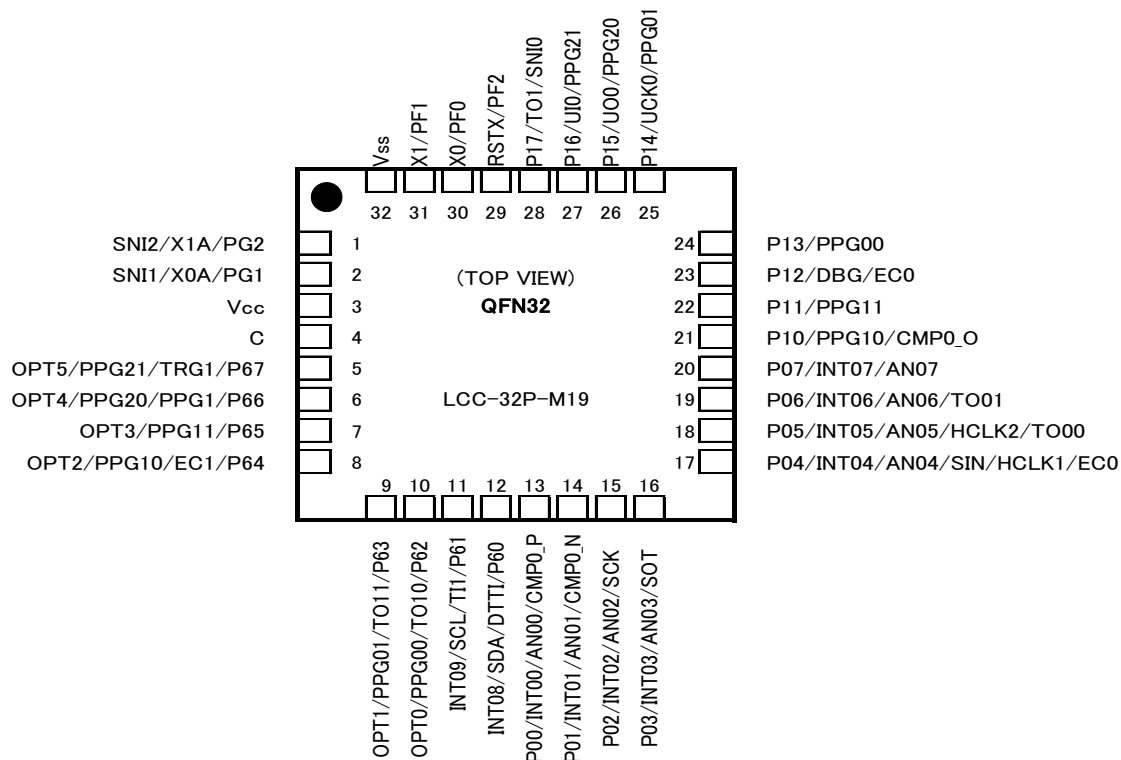
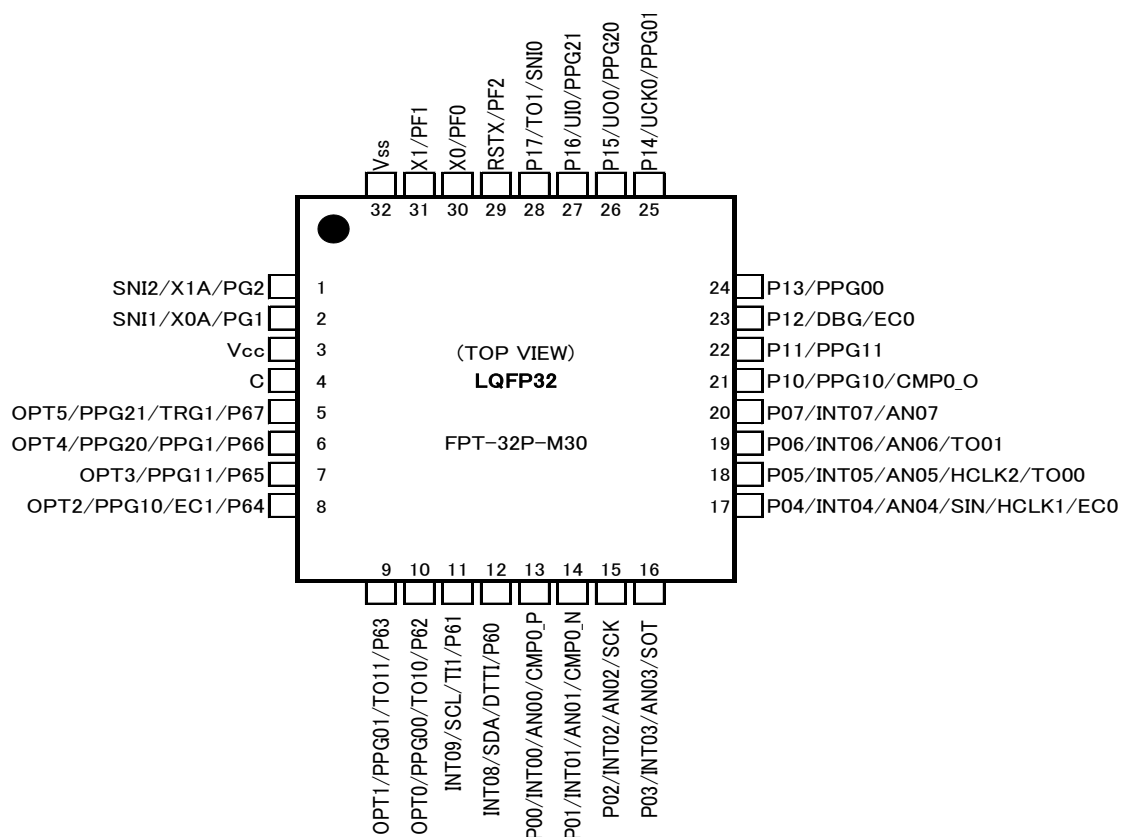
3.9 MB95F470H Series Pin Assignments

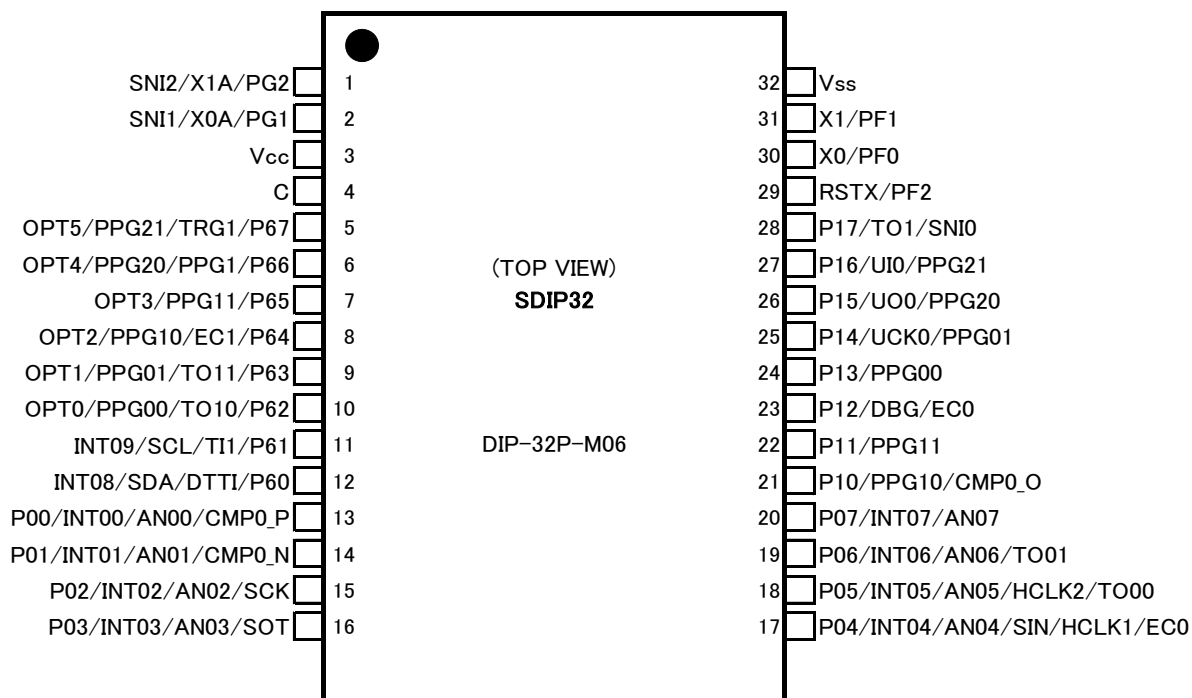


3.10 MB95F560H/570H/580H Series Pin Assignments

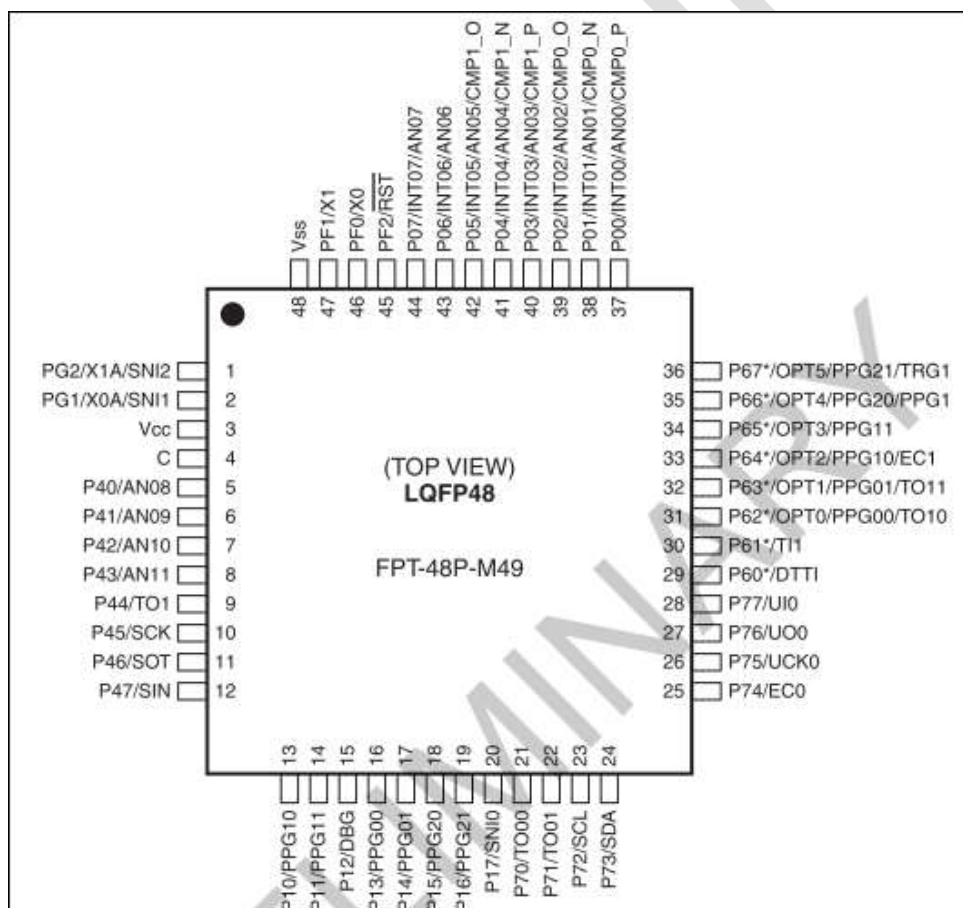


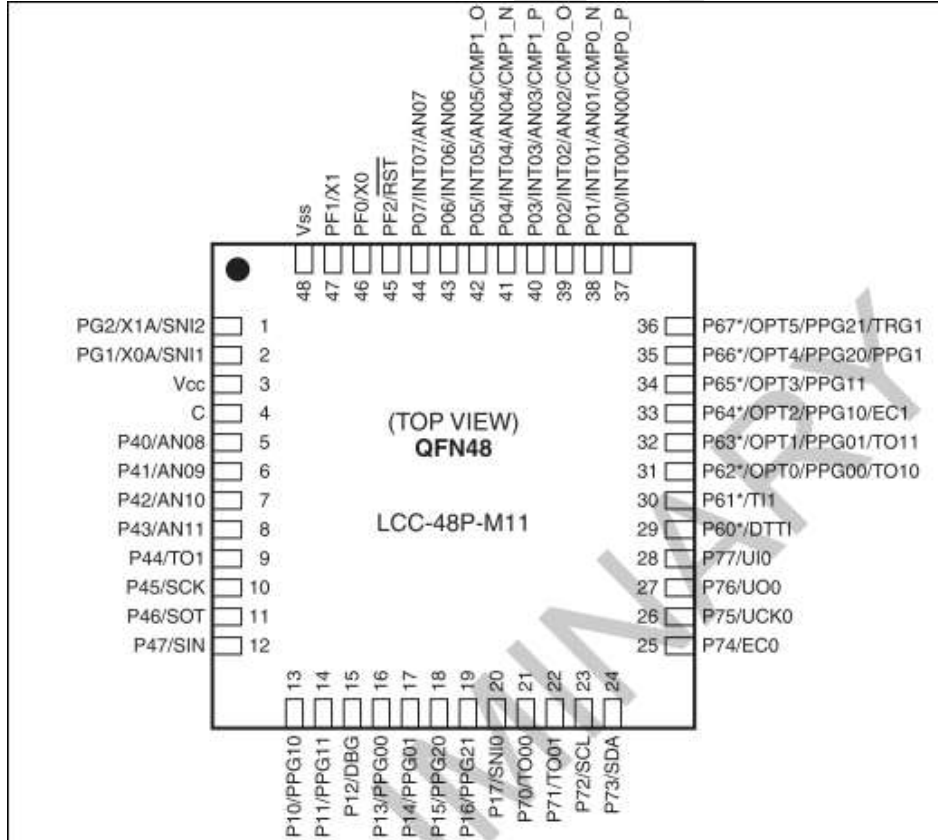
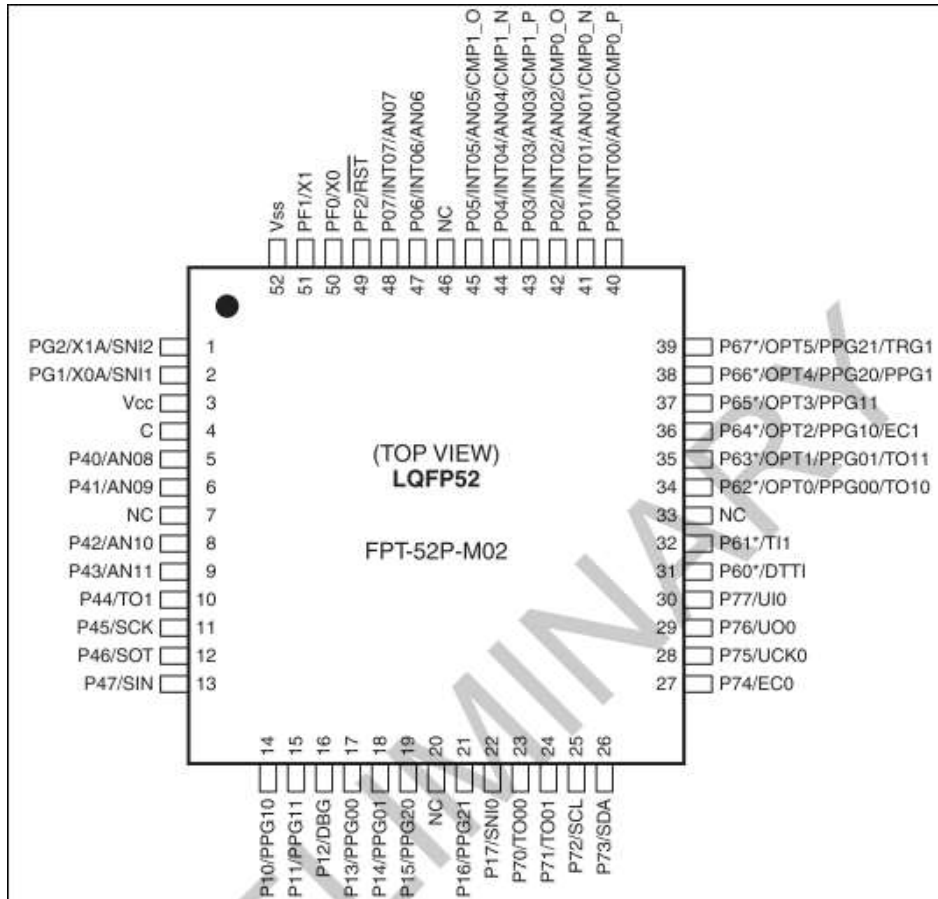
3.11 MB95F630H Series Pin Assignments





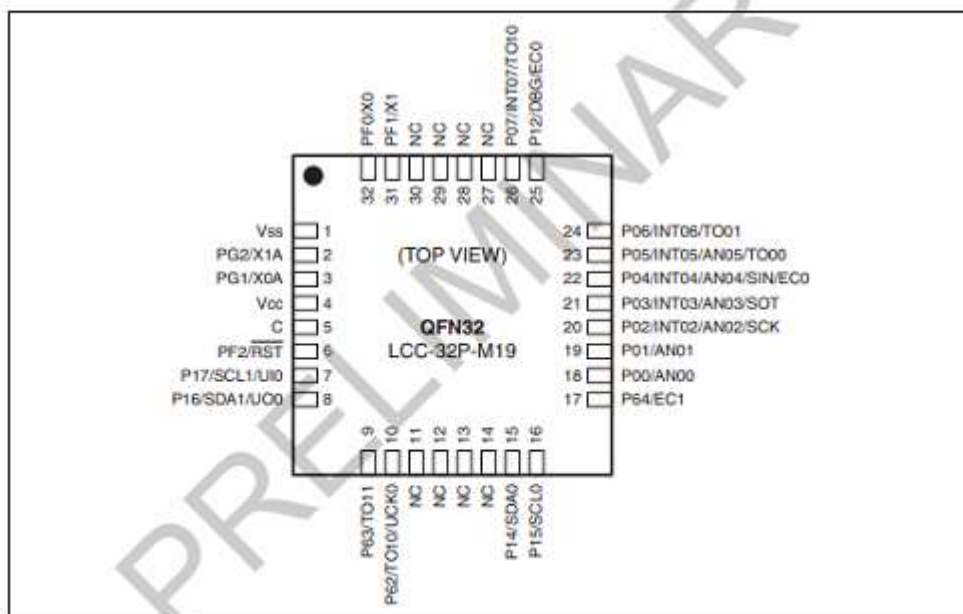
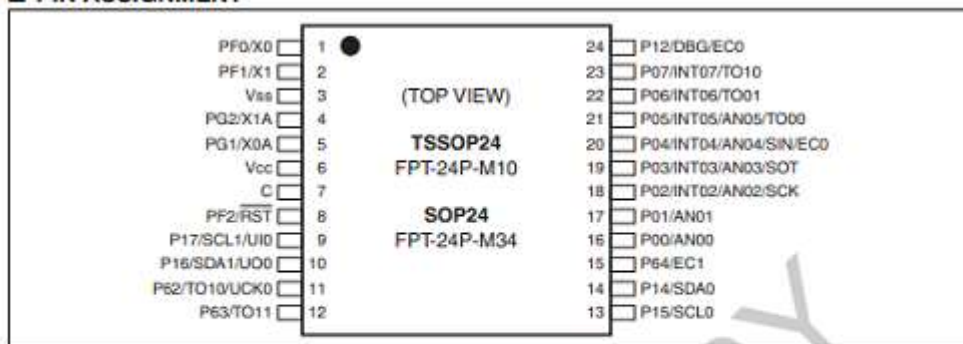
3.12 MB95F690K Series Pin Assignments



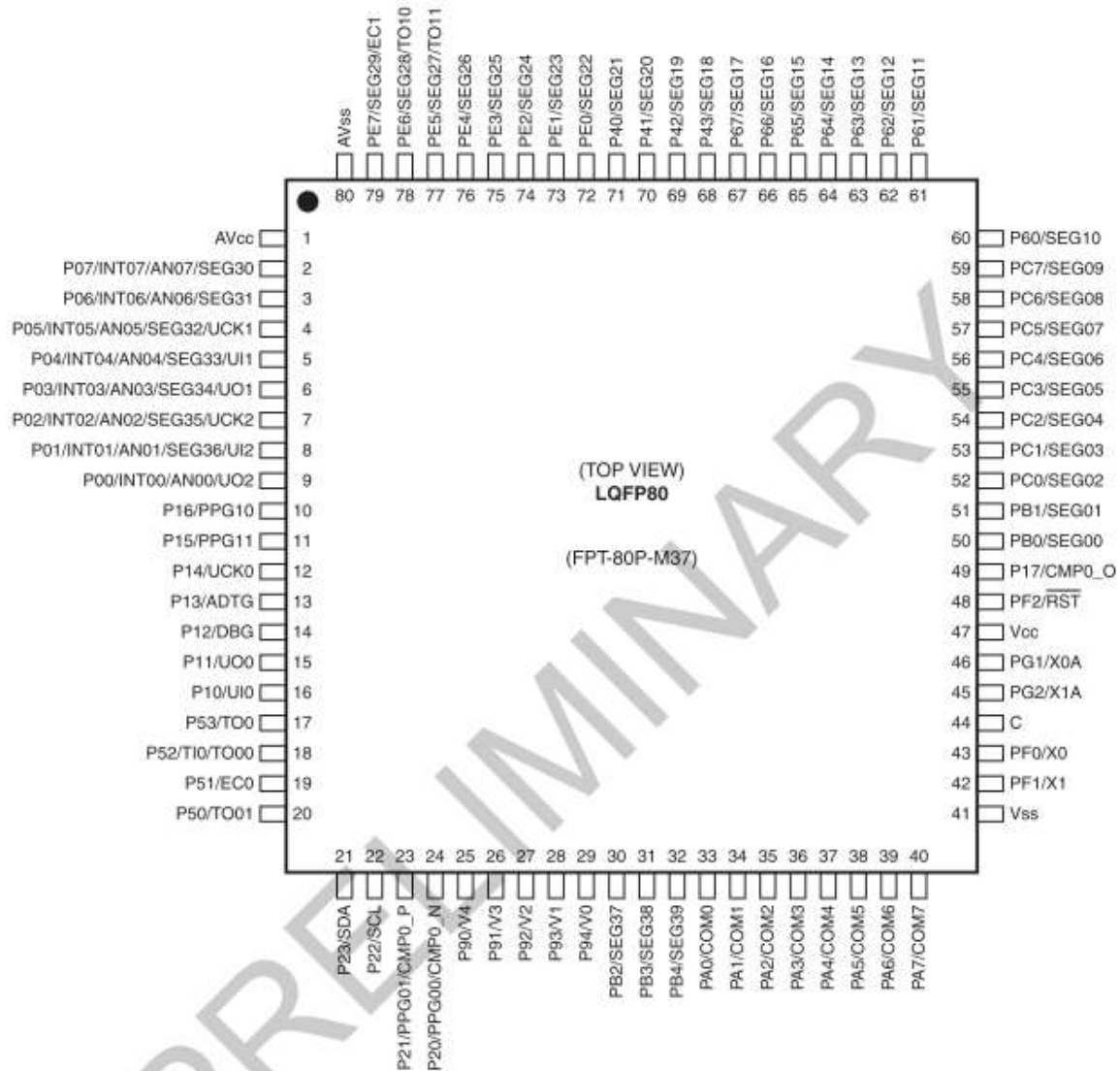


3.13 MB95F650L Series Pin Assignments

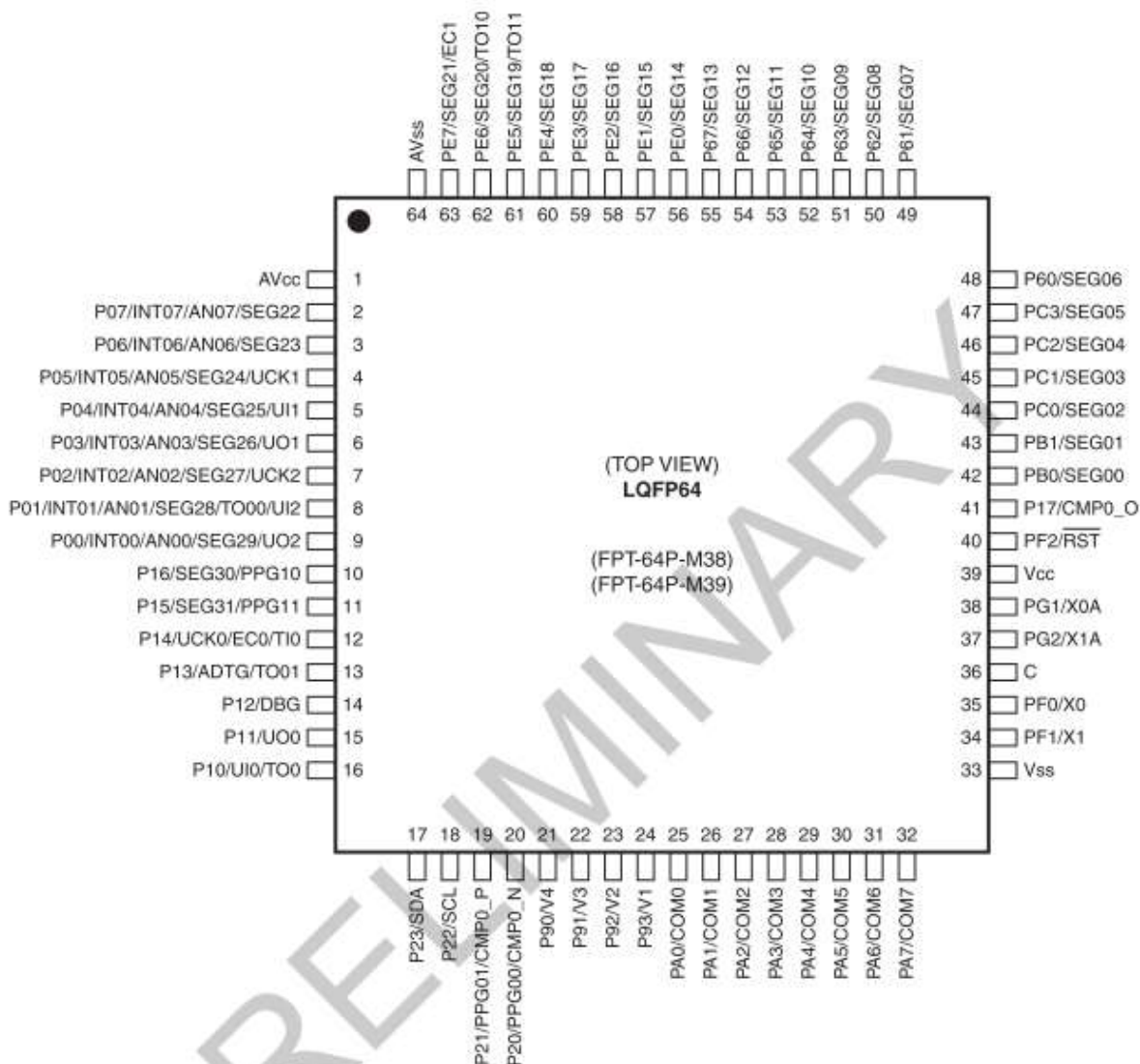
■ PIN ASSIGNMENT



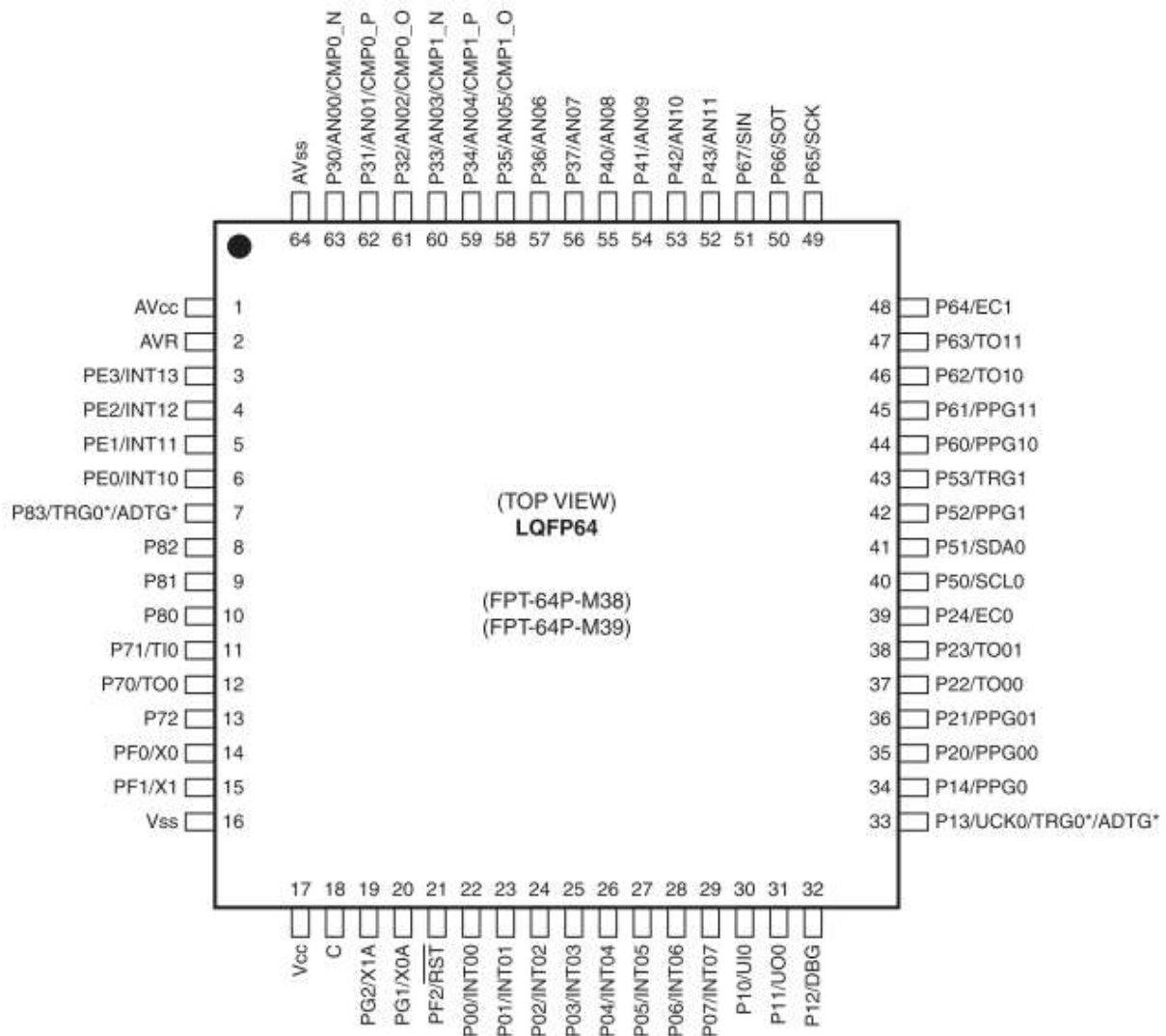
3.14 MB95F710L/710M Series Pin Assignments



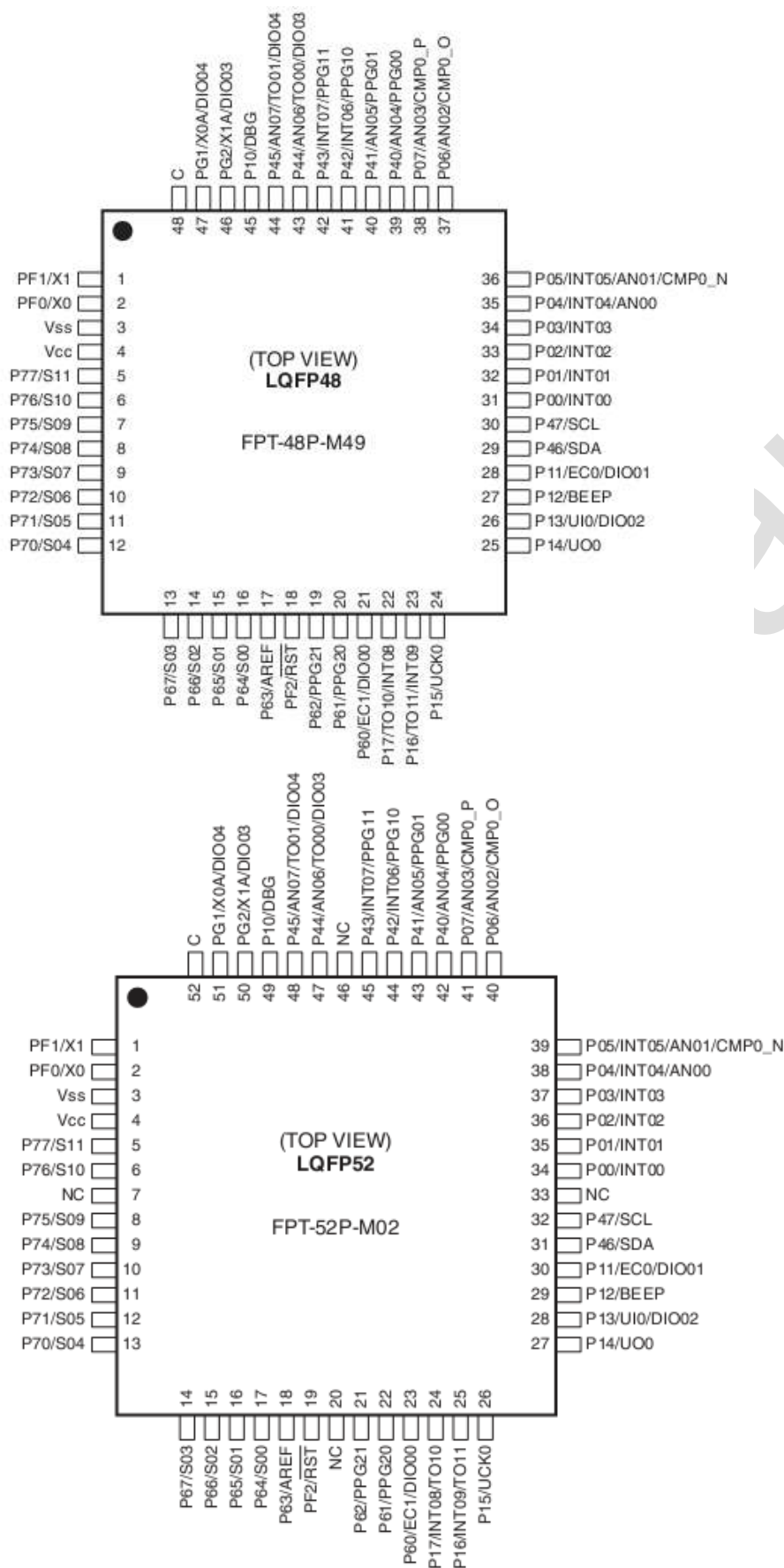
3.15 MB95F770L/770M Series Pin Assignments



3.16 MB95F810K Series Pin Assignments



3.17 MB95F870K Series Pin Assignments



4 MCU Flash Memory Space

4.1 MB95F200H/210H/220H Series Memory Map

New 8FX MB Number	Flash Size	Programmer/MCU Address
MB95F204H/F204K/F214H/F214K	16KB	C000H~FFFFH
MB95F203H/F203K/F213H/F213K/F223H/223K	8KB	E000H~FFFFH
MB95F202H/F202K/F212H/F212K/F222H/222K	4KB	F000H~FFFFH

4.2 MB95F260H/270H/280H Series Memory Map

New 8FX MB Number	Flash Size	Programmer/MCU Address
MB95F264H/F264K/F274H/F274K/F284H/F284K	20KB	B000H~FFFFH
MB95F263H/F263K/F273H/F273K/F283H/F283K	12KB	B000H~BFFFH E000H~FFFFH
MB95F262H/F262K/F272H/F272K/F282H/F282K	8KB	B000H~BFFFH F000H~FFFFH

4.3 MB95F330H 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

4.4 MB95F390H Series Memory Map

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

4.5 MB95F310L/370L Series Memory Map

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

4.6 MB95F350L Series Memory Map

New 8FX MB Number	Flash Size	Programmer/MCU Address
MB95F354E/F354L	20KB	B000H~FFFFH
MB95F353E/F353L	12KB	B000H~BFFFH E000H~FFFFH
MB95F352E/F352L	8KB	B000H~BFFFH F000H~FFFFH

4.7 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

4.8 MB95F410H Series Memory Map

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

4.9 MB95F470H Series Memory Map

New 8FX MB Number	Flash Size	Programmer/MCU Address
MB95F474H/F474K	20KB	1000H~1FFFH C000H~FFFFH
MB95F476H/F476K	36KB	1000H~1FFFH 8000H~FFFFH
MB95F478H/F478K	60KB	1000H~FFFFH

4.10 MB95F560H/570/580 Series Memory Map

New 8FX MB Number	Flash Size	Programmer/MCU Address
MB95F562HK/572H/K/582H/K	8KB	B000H~BFFFH F000H~FFFFH
MB95F563HK/573H/K/583H/K	12KB	B000H~BFFFH E000H~FFFFH
MB95F564HK/574H/K/584H/K	20KB	B000H~FFFFH

4.11 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

4.12 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

4.13 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

4.14 MB95F710L/710M 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

4.15 MB95F770L/770M Series Memory Map

New 8FX MB Number	Flash Size	Programmer/MCU Address
MB95F778E/L	60KB	1000H~FFFFH
MB95F776E/L	36KB	1000H~1FFFH 8000H~FFFFH
MB95F774E/L	20KB	1000H~1FFFH C000H~FFFFH

4.16 MB95F810K Series Memory Map

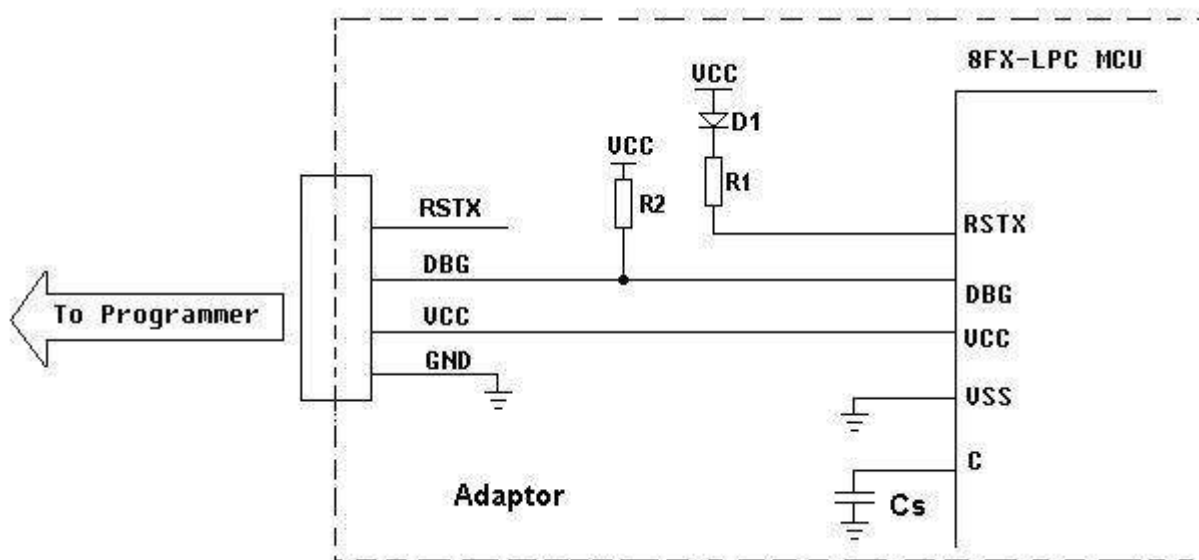
New 8FX MB Number	Flash Size	Programmer/MCU Address
MB95F818E/L	60KB	1000H~FFFFH
MB95F816E/L	36KB	1000H~1FFFH 8000H~FFFFH
MB95F814E/L	20KB	1000H~1FFFH C000H~FFFFH

4.17 MB95F870K Series Memory Map

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

5 Serial Programming Mode

5.1 Programmer Connection



Components Recommendation:

R1, R2: 10KΩ

Cs: 0.022uF/25V

D1: $V_F < 0.3V$ when $I_F = 1mA$. E.g. LL103A, 1SS294

Required pins for serial programming (5 pins are required to the programmer)

Pin	Function	Description
VCC	Power supply	The write voltage is supplied from the programmer system. *1 VCC and DBG pin timing controls the PGM mode entry, refer to the timing diagram in next section.
VSS	Power supply (GND)	Common to the GND with the programmer.
RSTX	Reset	The pull-up resistance is needed between RSTX pin and V _{CC} . Programmer provides 10V directly to RSTX pin during flash erase/write operation. *2 If it is pulled high in programming adaptor/user system, please consider to add a low-drop diode for separate H voltage. *2 The reserved connection between programmer and RSTX is recommended for the test
DBG	Mode control and 1-line UART	DBG pin provides 1-line UART communication with the Programmer. Serial programming mode can be set once provide the special (power-on) timing in DBG and VCC pin.

*1:

For MB95F260H/270H/280H/F430H/410H/470H/560H/570H/580H/630H/690K/870K/810K Series, the write voltage is from 3V~5.5V. 5V is recommended.

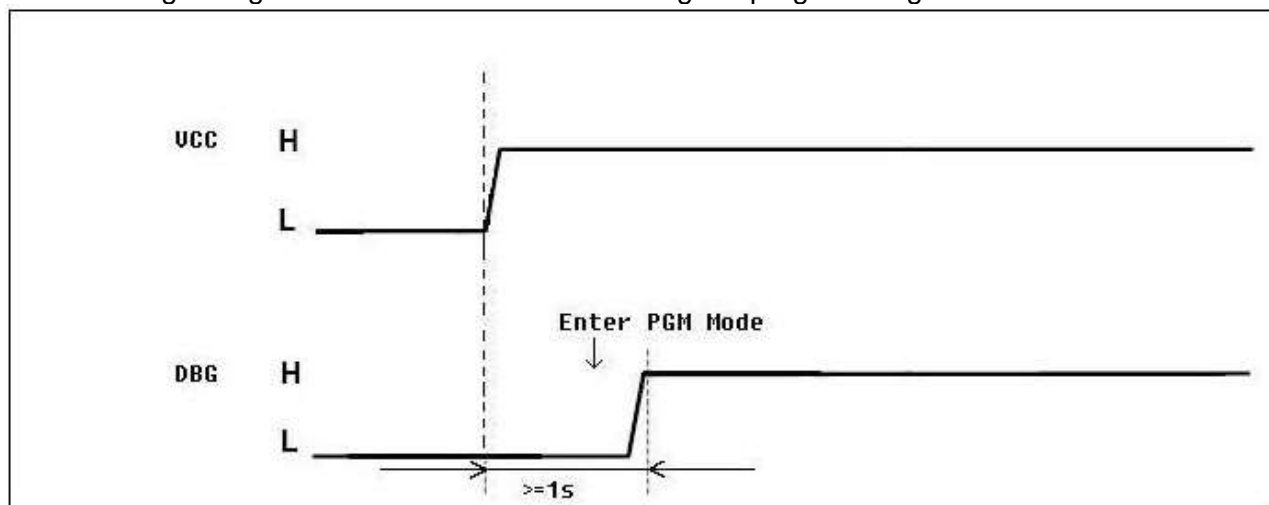
For MB95F310L/370L/350L Series, the write voltage is from 2.7V~3.6V. 3V is recommended.

For MB95F650L/710L/710M/770L/770M Series, the write voltage is from 1.8V~5.5V. 5V is recommended.

*2: For MB95F200H/210H/220H Series, the 10V high voltage is needed, and D1 for separate H voltage is recommended.

5.2 Programming Mode Entry Timing

The following timing enables New 8FX MCU entering the programming mode.



6 Serial Communication Outline

The following sections describe how to communication with New 8FX MCU.

6.1 1-line UART Features

1-line UART features:

Baud rate = 62500bps/500Kbps *1

8bit data length

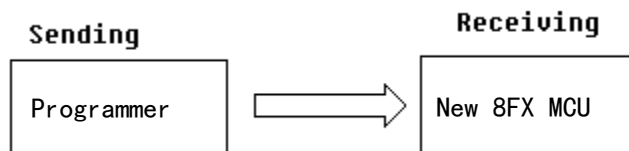
1bit stop bit

No parity

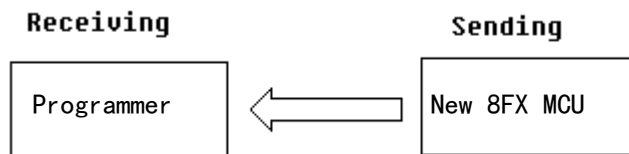
LSB first

All the communications are initialized by Programmer. That is, Programmer is master and New 8FX MCU is slave during serial programming 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.



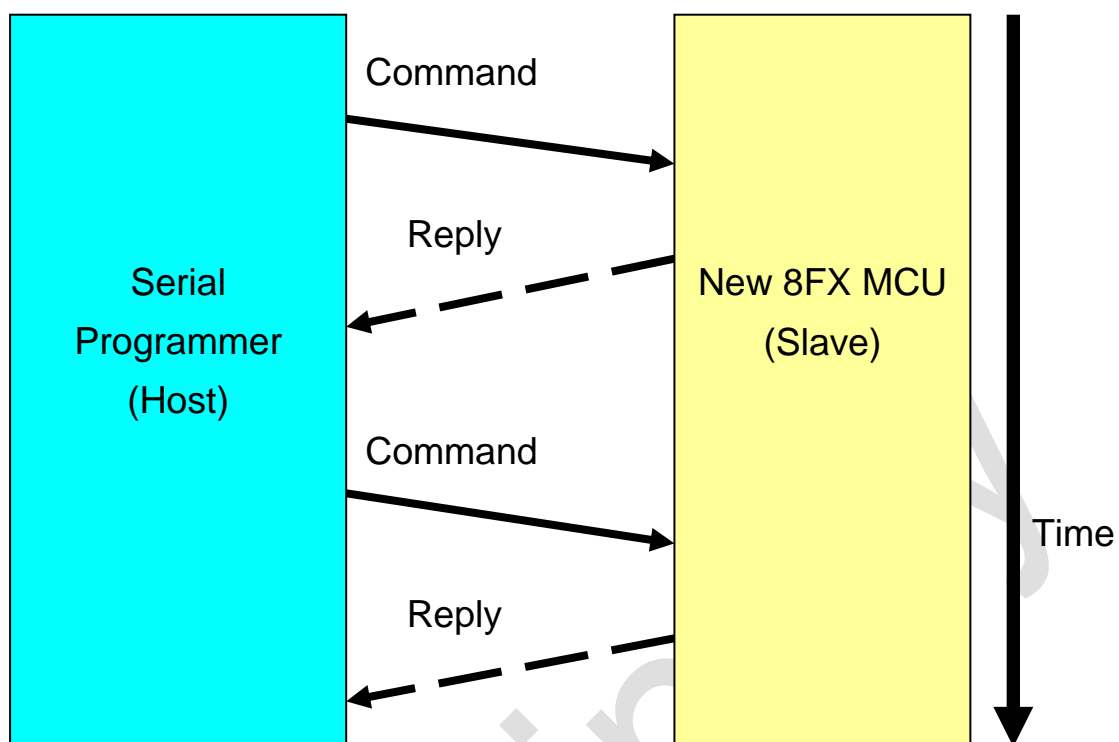
Both command frame and return frame transfer at the same time is forbidden based on the 1-line UART communication.

Notes:

*1: From here, all New 8FX MCU must set the initial baud rate to 62500bps for communication until FLASH initialize completed.

For MB95560H/570H/580H/630H/690K/870K/650L/710L/710M/770L/770M/810K Series, the baud rate can be changed up to 500Kbps after FLASH initialize step. Please refer to Table 7-1 for details setting.

6.2 The Communication Sequences Outline





7 Programming Commands Specification

7.1 Hand-shake Process

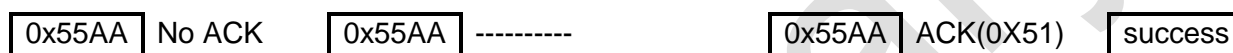
After the first power on entry, hand-shake with MCU is necessary before executing programming commands. The following is the hand-shank process:

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



If programmer receives 0x51 after sending 0x55AA, the hand-shank process is completed 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 5000 times, the hand-shake fails. It is necessary for programmer to power on MCU again and re-do the hand-shake operation.

7.2 Command Format Outline

Programmer can send commands to MCU only after the hand-shake succeeds. Command formats include basic command and functional command.

Basic command

They are fixed to 5 bytes, 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 byte is 0x00.

Functional command

Functional command provides read function and program function. The detailed will be described in the following sections.

7.3 Clock Modification Command

Clock modification command is used to modify clock setting 1mS after the hand-shake. This operation will increase New 8FX MCU running speed.

Programmer is recommended to keep less than 250uS interval time between each byte UART data transmitting to ensure MCU can receive these commands during sending them.

The Clock modification command is shown below:

Communication byte number	Transmit/Receive Data	Description	Communication direction
1 st byte	0x00	Fixed Data	Parameter set (62500bps)
2 nd byte	0x00	Fixed Data	
3 rd byte	0x07	Fixed Data	
4 th byte	0x07	Checksum	
5 th byte	0x00	ACK	
1 st byte	0x03	Fixed Data	Parameter set (62500bps)
2 nd byte	0x00	Fixed Data	
3 rd byte	XX *2	Fixed Data	
4 th byte	XX *3	Checksum	
5 th byte	0x00 *4	ACK	

Notes:

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

*2: For MB95F200H/260H/330H/390H/310L/370L/350L/430H/410H/470H Series, this Byte is 0x00.

For MB95F560H/570H/580H/630H/690K/870K/650L/710L/710M/770L/770M/810K/870K Series, this Byte is 0xD8

*3: For MB95F200H/260H/330H/390H/310L/370L/350L/430H/410H/470H Series, this Byte is 0x03.

For MB95F560H/570H/580H/630H/690K/870K/650L/710L/710M/770L/770M/810K/870K Series, this Byte is 0xDB

*4: If flash security is enabled, “0xFD” will be returned here. Please send chip erase command to MCU when “0xFD” received (refer to chapter 0 – flowchart).

7.4 Erase Command

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 sequence is shown below:

Communication byte number	Transmit/Receive Data	Description		Communication direction
1 st byte	0x00	Fixed Data	Parameter set (62500bps)	PGM to MCU
2 nd byte	0x00	Fixed Data		PGM to MCU
3 rd byte	0x0C	Fixed Data		PGM to MCU
4 th byte	0x0C	Checksum		PGM to MCU
5 th 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
5 th byte	0x00	ACK		MCU to PGM
Turn on 10V high voltage and output to RSTX pin *2				
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	0x##	Checksum		PGM to MCU
...	Erasing...			...
5 th byte	0x00 *1	ACK		MCU to PGM
Turn off 10V high voltage *2				

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 9.

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

Note

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

*2: 10V high voltage is only for MB95F200H/210H/220H

7.5 Flash Initialize Command

Flash initialize command should be sent to New 8FX MCU after erase operation. Then New 8FX MCU can accept read/write commands and enter read/write mode.

The following is the flash initialize command sequences:

Communication byte number	Transmit/Receive Data	Description	Communication direction
1 st byte	0x00	Fixed Data	PGM to MCU
2 nd byte	0x00	Fixed Data	PGM to MCU
3 rd byte	0x0C	Fixed Data	PGM to MCU
4 th byte	0x0C	Checksum	PGM to MCU
5 th byte	0x00	ACK	MCU to PGM
1 st byte	0x05	Fixed Data	PGM to MCU
2 nd byte	0x00	Fixed Data	PGM to MCU
3 rd byte	0x60	Fixed Data	PGM to MCU
4 th byte	0x65	Checksum	PGM to MCU
5 th byte	0x00	ACK	MCU to PGM
1 st byte	0x00	Fixed Data	PGM to MCU
2 nd byte	0x00	Fixed Data	PGM to MCU
3 rd byte	0x90	Fixed Data	PGM to MCU
4 th byte	0x90	Checksum	PGM to MCU
5 th byte	0x00	ACK	MCU to PGM
6 th byte	0x03	Fixed Data	PGM to MCU
7 th byte	0x00	Fixed Data	PGM to MCU
8 th byte	1 st data in Table 7-1	Data	PGM to MCU
9 th byte	6 th +7 th +8 th	Checksum	PGM to MCU
10 th byte	0x00 *1	ACK	MCU to PGM
11 th byte	0x03	Fixed Data	PGM to MCU
12 th byte	0x00	Fixed Data	PGM to MCU
13 th byte	2 nd data in Table 7-1	Data	PGM to MCU
14 th byte	11 th +12 th +13 th	Checksum	PGM to MCU
15 th byte	0x00	ACK	MCU to PGM
Repeat 11 th ~15 th	Send all data in Table 7-1		
N-4byte	0x0A	Fixed Data	PGM to MCU
N-3 byte	0x00	Fixed Data	PGM to MCU
N-2 byte	0x00	Fixed Data	PGM to MCU
N-1 byte	0x0A	Checksum	PGM to MCU
N byte	0x00	ACK	MCU to PGM

Table 7-1: data of flash initialize command (New 8FX UART PGM INIT DA.BIN)

F1	D4	01	56	05	YY*3	61	01	58	E5	01	60	41	F3	40	70
40	E4	70	30	71	04	00	EA	85	26	XX*2	E9	10	E9	E3	E9
4F	E9	48	E9	49	99	FF	FD	31	99	AA	FD	56	99	55	FD
69	99	88	FD	7F	05	YY*3	64	CF	45	YY*3	98	00	FD	0F	D8
E4	00	D9	40	E4	FF	D4	93	E0	F2	EA	21	00	CB	9F	00
FD	05	DF	D8	21	00	D0	21	00	AB	05	YY*3	64	CF	45	YY*3
AE	0C	98	00	FD	0F	D8	E9	E2	E4	01	02	40	E4	FF	E0
93	E0	21	00	F2	9F	00	FD	05	DF	D8	21	00	F7	A6	0C
21	00	AB	05	YY*3	64	CF	45	YY*3	F3	E2	E4	01	24	40	E4
FF	DE	93	E0	05	81	EA	21	00	AB	05	YY*3	64	CF	45	YY*3
AE	0C	04	00	10	08	E2	E4	01	3F	40	E4	FD	DF	E0	A6
0C	21	00	AB	50	71	50	E3	51	C4	01	56	E1	60	01	58
45	YY*3	85	26	XX*2	20										

Note

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

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

*2: For MB95200H/260H/330H/390H/310L/370L/350L/430H/410H/470H Series, this Byte is 04H.

For MB95560H/570H/580H/630H/690K/870K/650L/710L/710M/770L/770M/810K/870K Series, this Byte can be 02H, means setting the baud rate to 500Kbps.

*3: For MB95200H/260H/330H/390H/310L/370L/350L/430H/410H/470H/560H/570H/580H Series, this Byte is 80H.

For MB95630H/650L/690K/710L/710M/770L/770M/810K/870K Series, this Byte is 7CH.

7.6 Erase Command after Flash Initialize

Data can be read from New 8FX MCU flash through the below read command sequences.

1 st byte	0x##	Erase start Address H	Send Erase Flash Parameter (62500bps)	PGM to MCU
2 nd byte	0x##	Erase start Address L		PGM to MCU
3 rd byte	0x00	Reserve		PGM to MCU
4 th byte	0x00	Reserve		PGM to MCU
5 th byte	0xAA	Fixed Data		PGM to MCU
6 th byte	0x00	ACK		MCU to PGM

Note:

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

7.7 Read Command

Data can be read from New 8FX MCU flash through the below read command sequences.

Data can be read from PGM or X-MCU flash through the below read command sequences.				
1 st byte	0x##	Read start Address H	Send Read Flash Parameter (62500bps*1)	PGM to MCU
2 nd byte	0x##	Read start Address L		PGM to MCU
3 rd byte	0x##	Read Length H		PGM to MCU
4 th byte	0x##	Read Length L		PGM to MCU
5 th byte	0x00	Fixed Data		PGM to MCU
...	PGM receive the data from MCU			
6 th byte	0x##	Data	PGM receive data from MCU continuously (62500bps*1)	MCU to PGM
7 th byte	0x##	Data		MCU to PGM
...	0x##	Data		MCU to PGM
N-1	0x##	Data		MCU to PGM
N	0x##	Data		MCU to PGM

Note:

Read command is only effective after flash initialize command passed.

N = Read Length +5. If N is not correct, read operation failure.

*1. For MB95F560H/570H/580H/630H/690K/650L/710L/710M/770L/770M/810K/870K Series, the baud rate depends on BIN code set by FLASH initialize command.

7.8 Write Command

Data can be written in New 8FX MCU flash through the below write command sequences.

Turn on 10V high voltage and output to RSTX pin *2				
1st byte	0x##	Write start Address H	Send Write Flash Parameter (62500bps*3)	PGM to MCU
2nd byte	0x##	Write start Address L		PGM to MCU
3rd byte	0x##	Write Length H		PGM to MCU
4th byte	0x##	Write Length L		PGM to MCU
5th byte	0xFF	Fixed data		PGM to MCU
...	PGM sends the data to MCU			
6th byte	0x##	Data *1	PGM send data to MCU continuously (62500bps*3)	PGM to MCU
7th byte	0x##	Data		PGM to MCU
...	0x##	Data		PGM to MCU
N-1	0x##	Data		PGM to MCU
N	0x##	Data		PGM to MCU
Wait about 1ms				
Turn off 10V high voltage *2				

*1. Please refer to chapter 7.14 and chapter 9 for write operation time.

Write command is only effective after flash initialize command passed.

N = Write Length +5.

*2. 10V high voltage is only for MB95F200H/210H/220H

*3. For MB95560H/570H/580H/630H/690K/650L/710L/710M/770L/770M/810K/870K Series, the baud rate depends on BIN code set by FLASH initialize command.

7.9 Write CR Trimming Command

Data can be read from New 8FX MCU flash through the below read command sequences.

1st byte	0x##	Write start Address H	Send Write Flash Parameter and send data (62500bps*3)	PGM to MCU
2nd byte	0x##	Write start Address L		PGM to MCU
3rd byte	0x00	Reserve		PGM to MCU
4th byte	0x##	Data		PGM to MCU
5th byte	0x55	Fixed Data		PGM to MCU

*1. Please refer to chapter 7.14 and chapter 9 for write operation time.

Write command is only effective after flash initialize command passed.

N = Write Length +5.

*2. 10V high voltage is only for MB95F200H/210H/220H

*3. For MB95F630H/690K/870K/650L/710L/770L/810K Series, the baud rate depends on BIN code set by FLASH initialize command.

Note: if using old 0.35um product, maybe it cannot use this command.

7.10 Quit Command

New 8FX MCU can quit from read/write mode through quit command.

1st byte	0x##	Reserved	Send command Parameter (62500bps*1)	Quit	PGM to MCU
2nd byte	0x##	Reserved			PGM to MCU
3rd byte	0x##	Reserved			PGM to MCU
4th byte	0x##	Reserved			PGM to MCU
5th byte	0x88	Fixed data			PGM to MCU

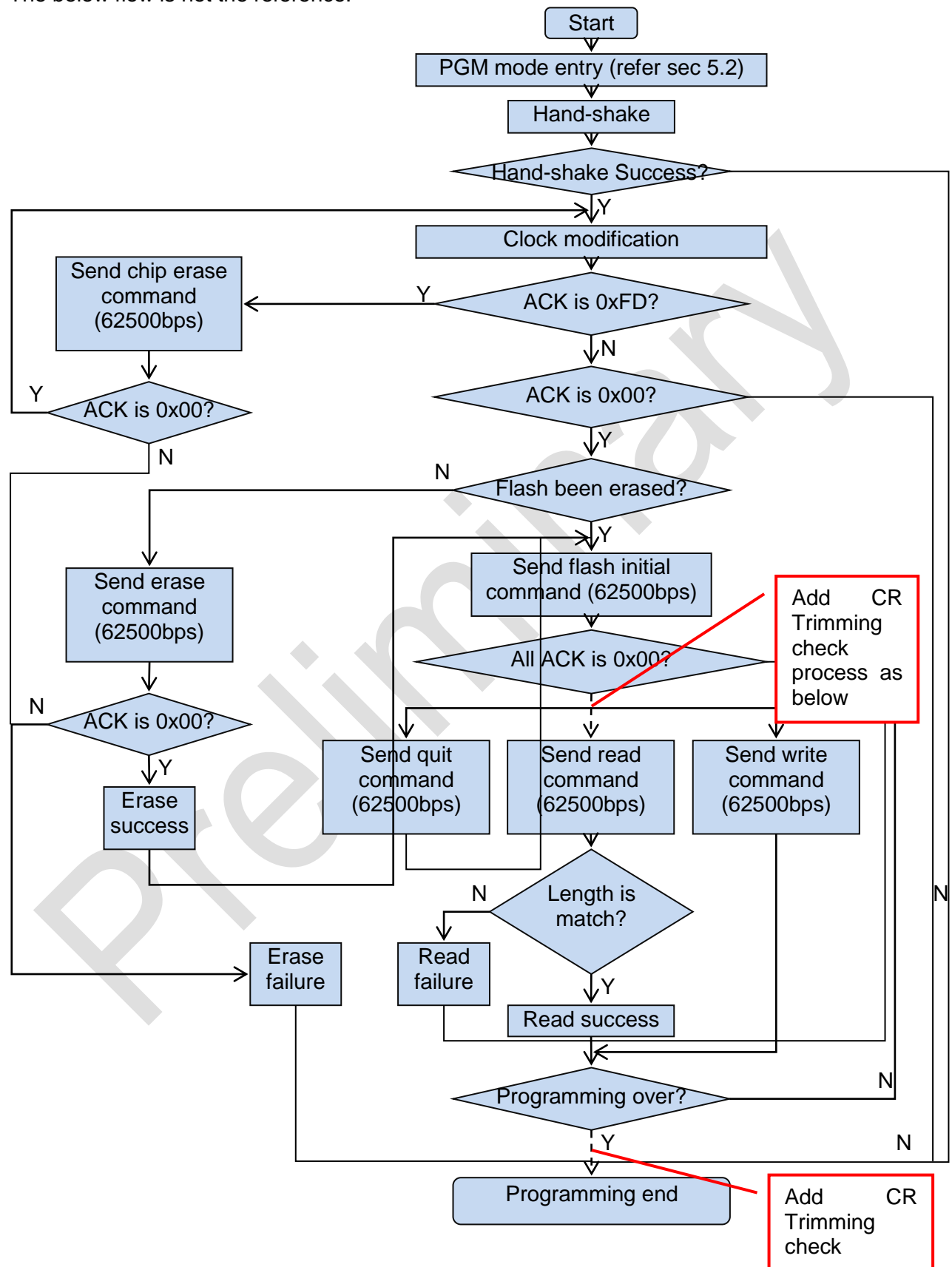
Note:

Quit command could only be sent in flash read/write mode.

*1. For MB95F630H/690K/650L/710L/710M/770L/770M/810K/870K Series, the baud rate depends on BIN code set by FLASH initialize command.

7.11 Recommend Programming Flow Chart

The below flow is not the reference.

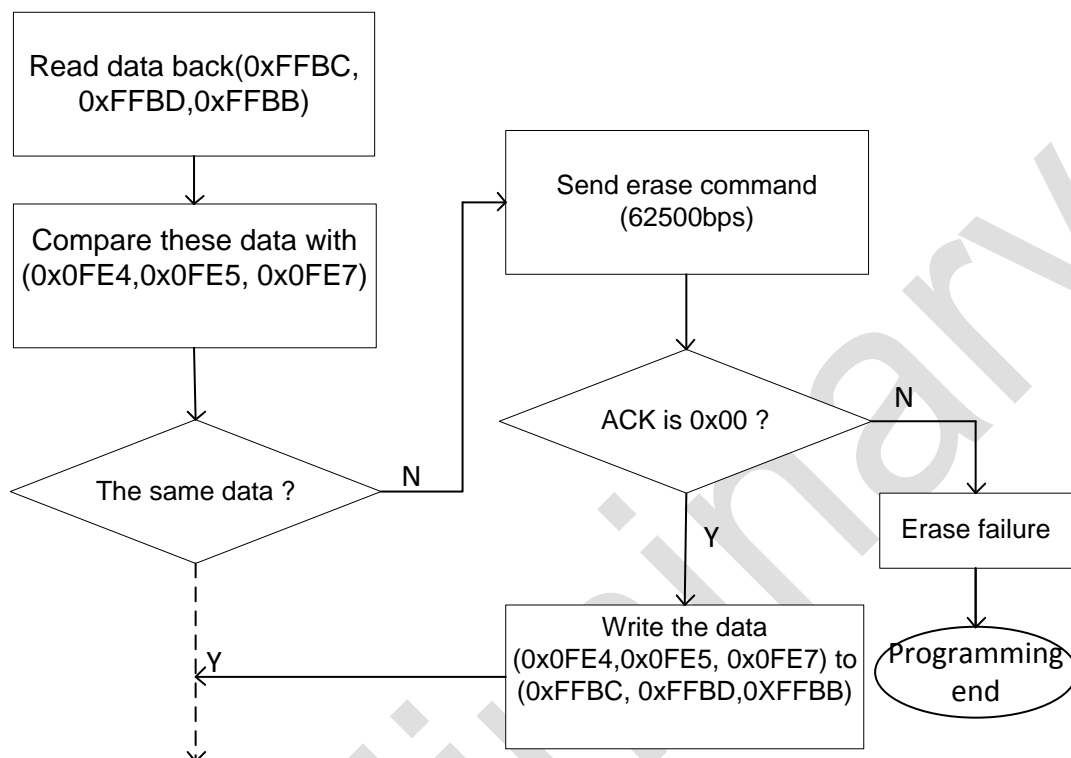


Add CR Trimming Value check process:

After finishing erasing successfully, read data back from flash area and then compare these data with the data in RAM, if the data is different, and send sector erase command to sector erase, then write the data in RAM to flash (the corresponding flash address). And after programming end, do CR Trimming check process again.

0.35um product: compare 0xFFBC 0xFFBD with 0xFE4, 0xFE5

0.18um product: compare 0xFFBC 0xFFBD 0xFFBB with 0xFE4, 0xFE5, 0xFE7



It is recommended to do flash erase before enter into read/write mode in factory mode. But without erase operation, read and write operation also can be accessed firstly. Please power on again if programmer encountered any failure.

7.12 Blank Check Operation

For MB95F200H/260H/330H/390H/310L/370L/350L/430H/410H/470H Series, Blank Check is realized by Read flash memory. If all the read data are blank except 0xFFBC bit [4:0], bit [7] and 0xFFBD data, the blank check operation should be passed.

These 3 bytes are for CR trimming value storage in flash memory NVR area, and it will be re-written into flash memory after erase operation by MCU itself if following this programming spec.

Address	bit	Programmer operation
0xFFBC	Bit [7]	No need check blank
0xFFBC	Bit [6:5]	Need check blank ^{*1}
0xFFBC	Bit [4:0]	No need check blank
0xFFBD	Bit [7:0]	No need check blank
All other flash address	All	Need check blank

For MB95F560H/630H/690K/870K/650L/710L/710M/770L/770M/810K/870K Series, Blank Check is realized by Read flash memory. If all the read data are blank except the address as below, the blank check operation should be passed.



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

*1, For MB95F200H/260H/330H/390H/310L/370L/350L/430H/410H/470H Series, the 2 bits are programmed.

7.13 Verify Operation

For MB95F200H/260H/330H/390H/310L/370L/350L/430H/410H/470H Series, Verify is realized by Read flash memory. If each read data except 0xFFBC bit [4:0], bit [7] and 0xFFBD data equal to the written data, verify operation should be passed.

These 3 bytes are for CR trimming value storage in flash memory NVR area, and it will be re-written into flash memory after erase operation by MCU itself if following this programming spec.

Address	bit	Programmer operation
0xFFBC	Bit [7]	No need verify
0xFFBC	Bit [6:5]	Need verify ^{*2}
0xFFBC	Bit [4:0]	No need verify
0xFFBD	Bit [7:0]	No need verify
All other flash address	All	Need verify

For MB95F560H/630H/690K/870K/650L/710L/710M/770L/770M/810K/870K Series, Verify is realized by Read flash memory. If each read data except below address equal to the written data, verify operation should be passed.

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

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

*2, For MB95F200H/260H/330H/390H/310L/370L/350L/430H/410H/470H Series, the 2 bits are programmed.

7.14 Performance Estimation

The estimated performance of the above processes is listed below:

Command Name	Estimated Performance (Typical)
Hand-shake	11.1~202ms
Clock modification	10.6ms
Sector erase	= flash sector erase time described in data sheet
Chip erase	= flash sector erase time described in data sheet
Flash Initialize	102ms
Read Flash	160us/byte*1
Write Flash	160us/byte*1

Note:

*1: For MB95560H/570H/580H/F630H/690K/870K/650L/710L/710M/770L/770M/810K/870K series, the Read/Write performance is 50us/byte while baud rate is set to 500Kbps in flash initialize step.

8 Flash Security Operation

After flash initialize process completed, 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 or quit command 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 0 and 0

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”.

9 Flash Memory Operation Characteristics

9.1 MB95200H/210H/220H/260H/270H/280H/330H/390H/430H/410H/470H 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 00 _H prior to erasure is excluded.
Sector erase time (16 Kbyte sector)	—	0.5* ¹	7.5* ²	s	The time of writing 00 _H 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).

9.2 MB95310/370/350L 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 00 _H prior to erasure is excluded.
Sector erase time (16 Kbyte sector)	—	0.5* ¹	7.5* ²	s	The time of writing 00 _H 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).

9.3 MB95560H/570H/580H 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 00 _H prior to erasure is excluded.
Sector erase time (16 Kbyte sector)	—	0.6 ^{*1}	3.1 ^{*2}	s	The time of writing 00 _H 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	5 ^{*3}	—	—	year	Average T _A = +85°C

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

9.4 MB95630H 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)

9.5 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)

9.6 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.)

9.7 MB95710L/710M/770L/770M 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.)

9.8 MB95810K 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.)

9.9 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.)



10 Appendix

10.1 List of Figures and Tables

Table 7-1: data of flash initialize command (New 8FX UART PGM INIT DA.BIN).....	45
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Preliminary