

**F<sup>2</sup>MC-8L FAMILY**  
8-BIT MICROCONTROLLER  
**MB89F538**

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**PROGRAMMING GUIDE**

APPLICATION NOTE

## Revision History

Date	Issue
2002-11-06	First release
2003-01-08	Revision 2.0
2003-03-04	Revision 2.1; calculation errors removed
2003-04-10	Revision 2.2; typo on p. 7 removed

This document contains 13 pages.

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## 0 Introduction

This application note describes how to program the Fujitsu MB89F538 MCU in serial asynchronous mode.

# 1 Software Setup

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## FUJITSU FLASH MCU PROGRAMMER

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### 1.1 Installation

To install the Fujitsu Flash 8-Bit-MCU Programming Software, you have to execute the program "PCW8Fsetup.exe". Then follow the steps of the setup dialog.

After successful installation, you will find the Fujitsu Flash MCU programmer in the folder:

"C:\Program Files\Fujitsu\FUJITSU FLASH MCU Programmer\FMC8L(FLASH)\flash.exe"

The symbol of this tools looks like the following picture

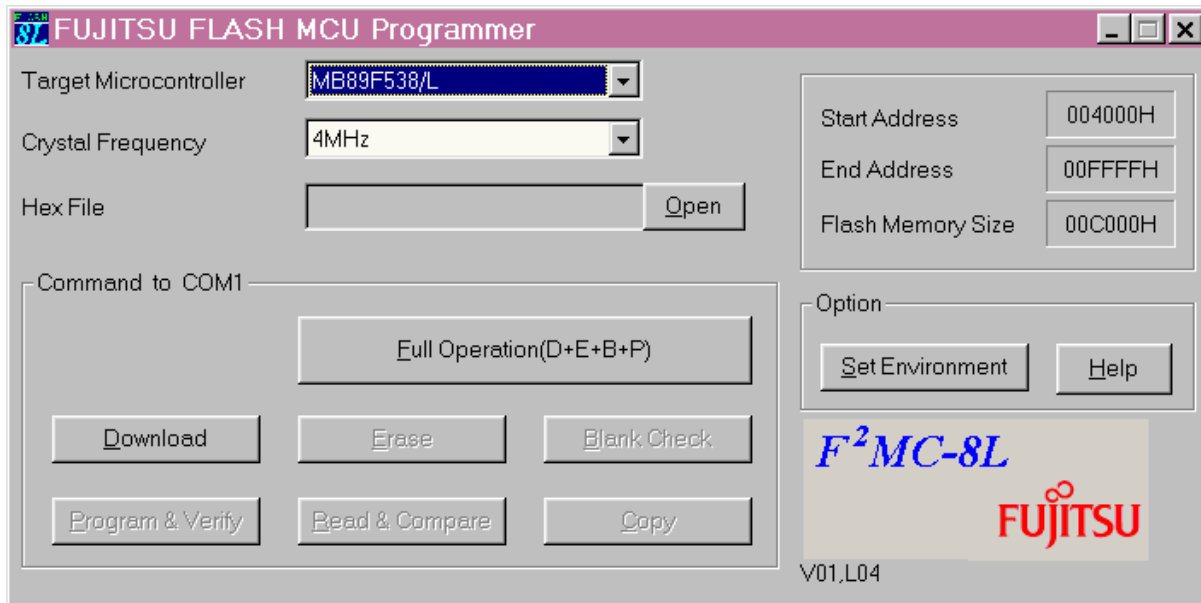


## 2 Flash Programmer

### USING THE FLASH PROGRAMMER

#### 2.1 Programming the MB89F538

When the Fujitsu Flash 8-Bit MCU Programmer, “flash.exe”, is executed the following window will occur:



The target microcontroller is MB89F538/L, and the crystal frequency has to be set to the used crystal frequency on the target board. 2MHz, 4MHz and 8MHz are available. For other frequencies see the next chapter.

To program the flash with your code, first set the MCU into Serial Programming Mode (see Chapter 3 for hardware settings). Then choose Open for selecting the code to be programmed into the Flash Memory. This code has to be a mhx-, cnv-, or ahx-object file, which was generated by a compiler tool (e. g. Softune Workbench).

After selecting the hex-file press the Full Operation (D+E+B+P) button. This means that the programming steps “download”, “erase”, “blank check”, and “program & verify” will be executed sequentially.

Alternatively you can use Download first. Then the commands Erase, Blank Check, Program & Verify, and Read & Compare have to be used separately.

Note: If Download is used, Full Operation can not be used afterwards.

## 2.2 Customize Crystal Frequencies

It is possible to use different crystal frequencies than the default frequencies.

For this the file “Chipdef.ini” in the “FMC8L(FLASH)” directory can be customized with a standard text editor.

Assume you want to use a 5MHz crystal. Open the file “Chipdef.ini” and change the following entries:

Old: Clock=2MHz, 4MHz, 8MHz	New: Clock=2MHz, 4MHz, <b>5MHz</b> , 8MHz, <b>10MHz</b>
Baud=1200, 2400, 4800	Baud=1200, 2400, <b>3000</b> , 4800, <b>5900</b>
Baud2=2400, 4800, 9600	Baud2=2400, 4800, <b>6000</b> , 9600, <b>11520</b>

After you have done the changes, save the file and then start the Fujitsu Flash 8-Bit MCU Programmer.

Now the added crystal frequency occurs in the *Crystal Frequency* text field.

Note, Baud is the baud rate for downloading the transfer program and Baud2 the rate this program uses.

Calculation formulas for the baud rates:

$$\mathbf{Baud_{MCU}} = \Phi \cdot 0.0006 \text{ Bit/Hz}\cdot\mathbf{s}$$

$$\mathbf{Baud2_{MCU}} = \Phi \cdot 0.0012 \text{ Bit/Hz}\cdot\mathbf{s} \qquad \Phi = \text{crystal frequency in Hz}$$

$$\mathbf{Baud_{PC}} = 230400 \text{ Hz} / (\lfloor 230400 \text{ Hz} / (2 \cdot \mathbf{Baud_{MCU}}) \rfloor \cdot 2)$$

$$\mathbf{Baud2_{PC}} = 230400 \text{ Hz} / (\lfloor 230400 \text{ Hz} / (2 \cdot \mathbf{Baud2_{MCU}}) \rfloor \cdot 2)$$

$\lfloor \rfloor = \text{floor function}^*$

The baud rate setting for  $\Phi$  is only valid, if

$$\mathbf{0.955 \leq (Baud_{MCU}/Baud_{PC}) \leq 1.045}$$

and  $\mathbf{0.955 \leq (Baud2_{MCU}/Baud2_{PC}) \leq 1.045}$  .

This means, that the PC-UART baud rates deviation to MCU baud rates must not less than -4.5% and bigger than 4.5%.

If the both baud rates are valid, the PC-UART baud rates have to be entered in the file “Chipdef.ini”.

Note: Please refer to the Clock Timing chapter in the Data sheet for the minimum and maximum crystal frequencies.

\*greatest integer function

## 3 Hardware Settings

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### HOW TO PROGRAM THE FLASH MCU

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#### 3.1 Pin Settings

##### 3.1.1 Serial Asynchronous Programming

To program the flash memory some pins of the MCU has to be set to several voltage levels ( $V_{SS}$  and  $V_{CC}$ ).

To enter the flash programming mode use the following pins settings and reset the MCU (low means  $V_{SS}$  and high means  $V_{CC}$ ):

Flash Programming Mode				
Pin Name	Pin No. (DIP-M01)	Pin No. (FPT-M06)	Pin No. (FPT-M09)	Logic Level
MOD0	28	21	20	High
MOD1	29	22	21	High
MOD2	10	3	2	Low
P10	48	41	40	Low
P22	38	31	30	High
P23	37	30	29	Low

To download the software use the SI1(U11)-Pin for serial input and the SO1(UO1)-Pin for serial output.

Caution: To connect the MCU to the serial PC interface (RS232) you have to use a voltage level shifter (e.g. MAX232).

The Flash Programming Tool described in chapter 2.1 can be used for programming.

Attention: Do not abort the sequence “Erase Flash” by switching off the power of the MCU, by resetting the MCU or by aborting the programming tool! The Flash Memory can be damaged permanently in this case!

##### 3.1.2 Run Mode

After programming the Flash Memory the MCU executes the program in its run mode by setting the pins MOD0, MOD1, MOD2 to “Low” level and resetting it (or after power on). The Pins P10, P22, and P23 are working then as resource input/output or general purpose pin.

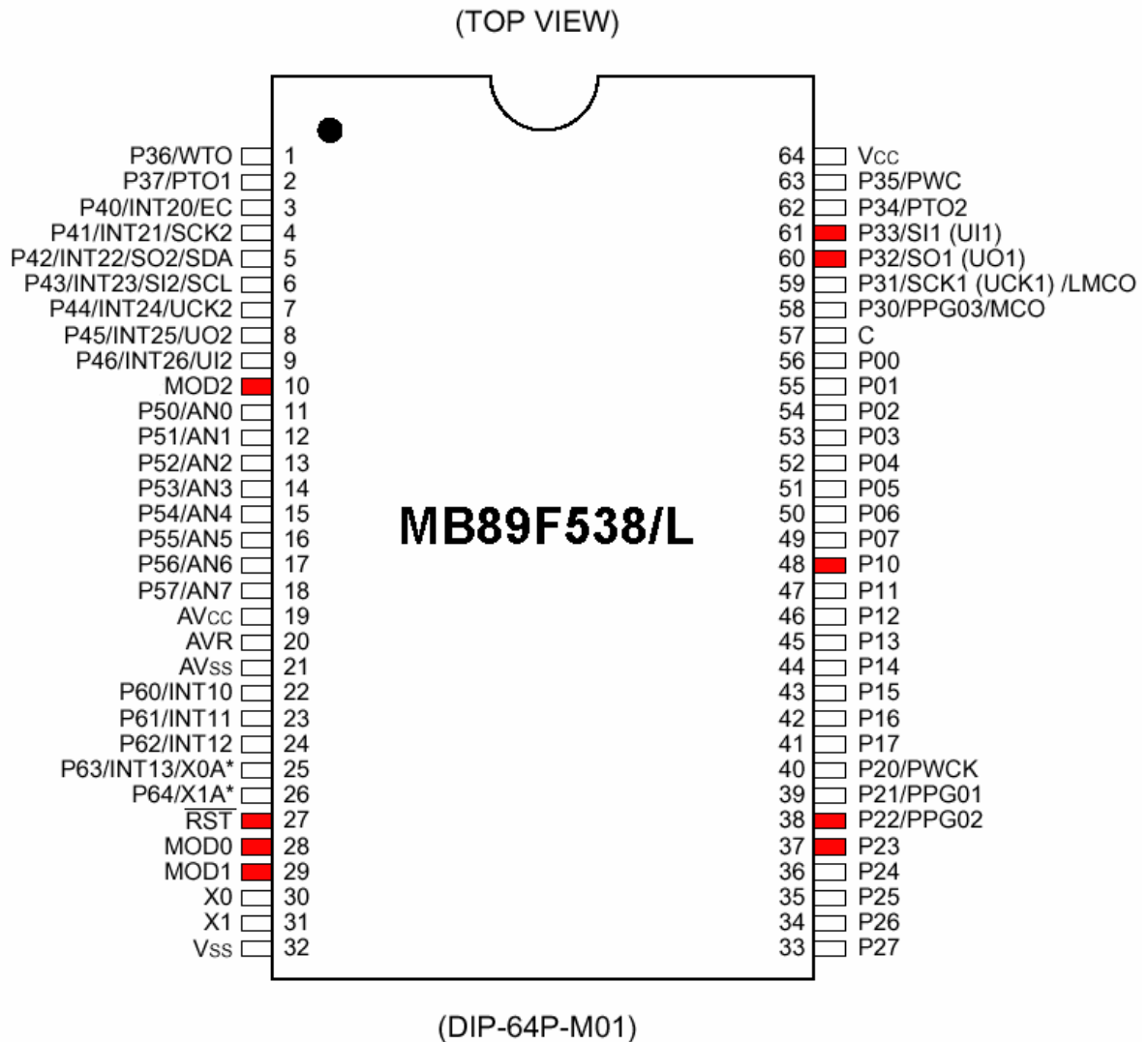
## 4 Pin Assignment

### PINS FOR FLASH PROGRAMMING OF DIFFERENT PACKAGES

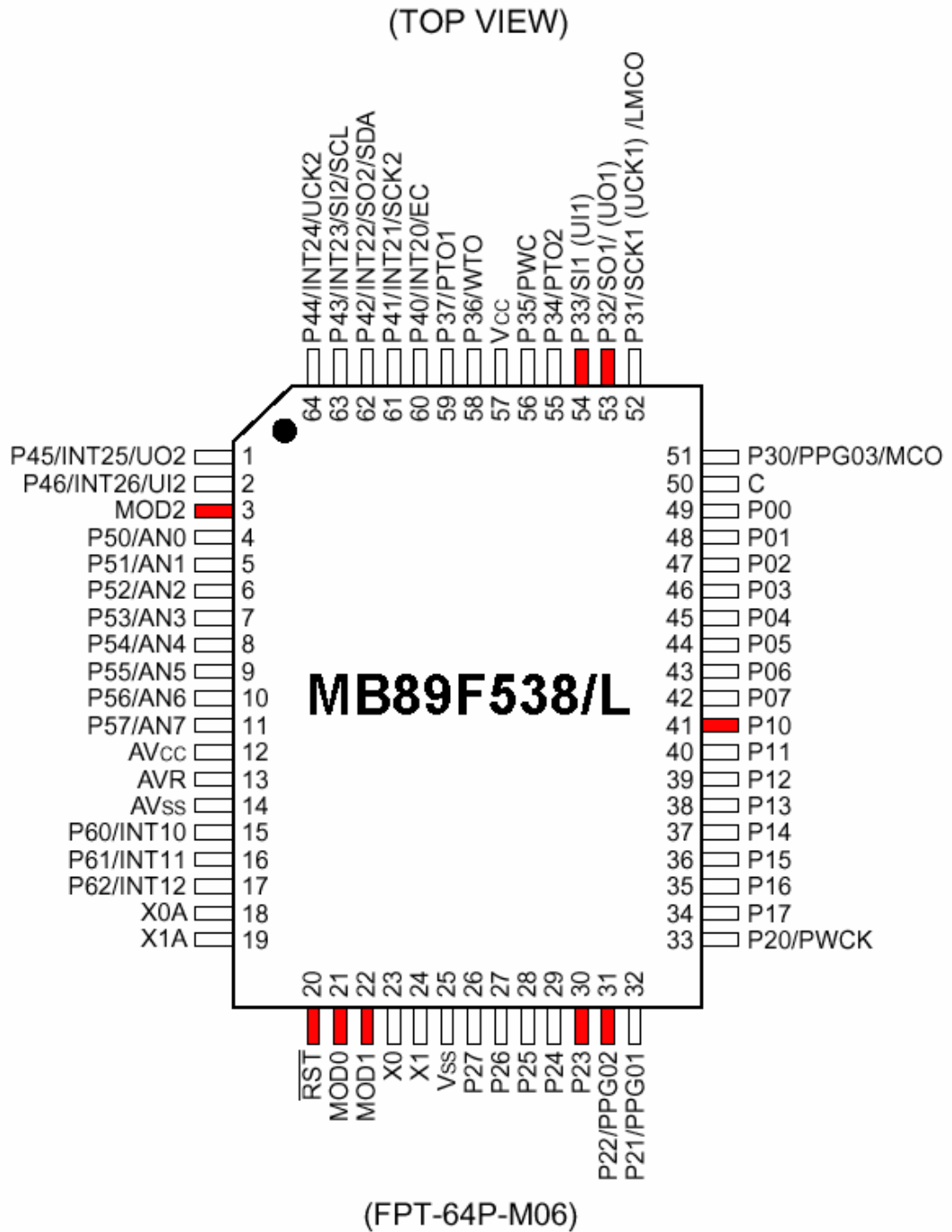
#### 4.1 Related Pins for Programming

In the following illustrations show the related pins for programming the Flash Memory. These pins are marked red (grey).

##### 4.1.1 MB89F538/L DIP-64P-M01

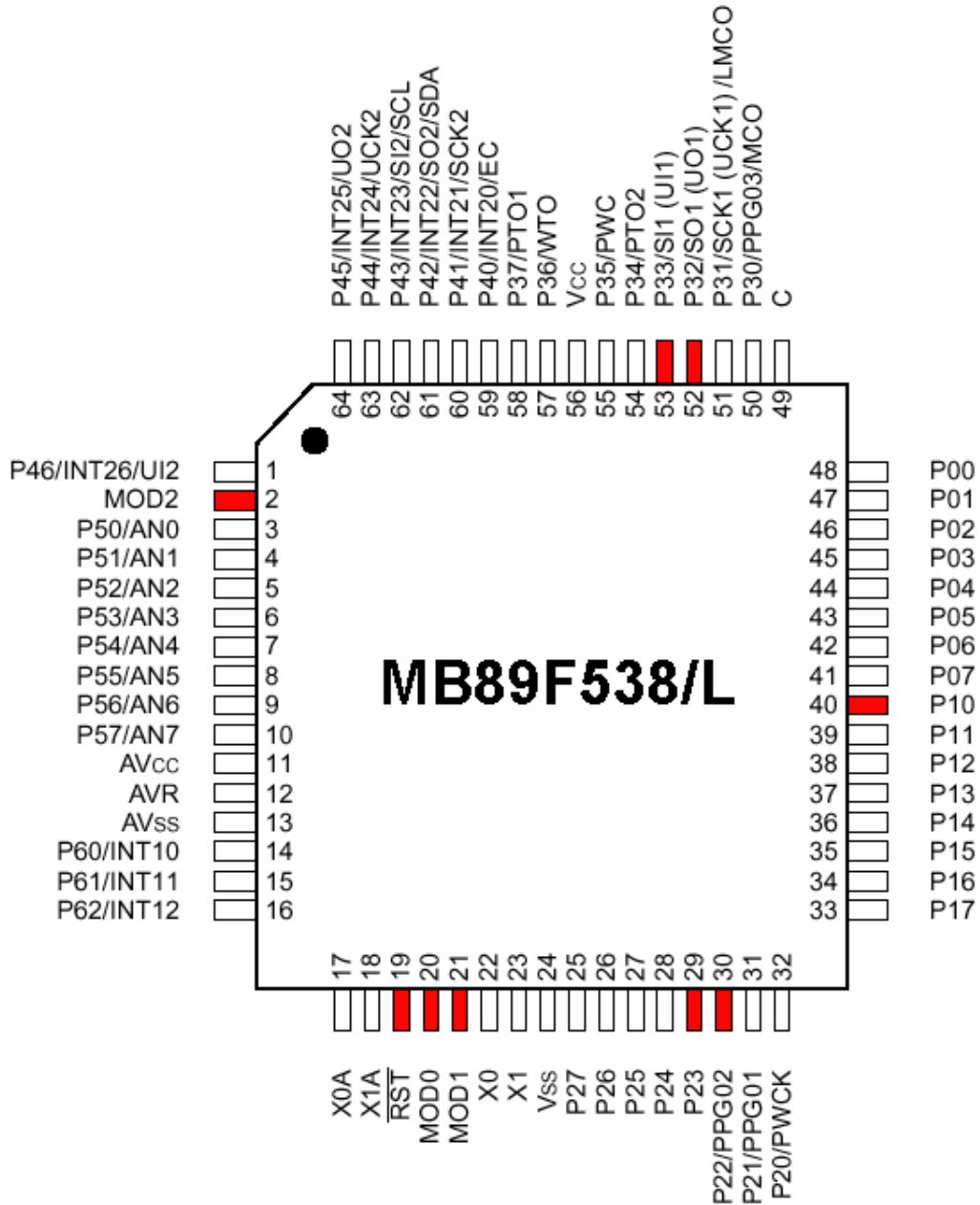


4.1.2 MB89F538/L FPT-64P-M06



4.1.3 MB89F538/L FPT-64P-M09

(TOP VIEW)



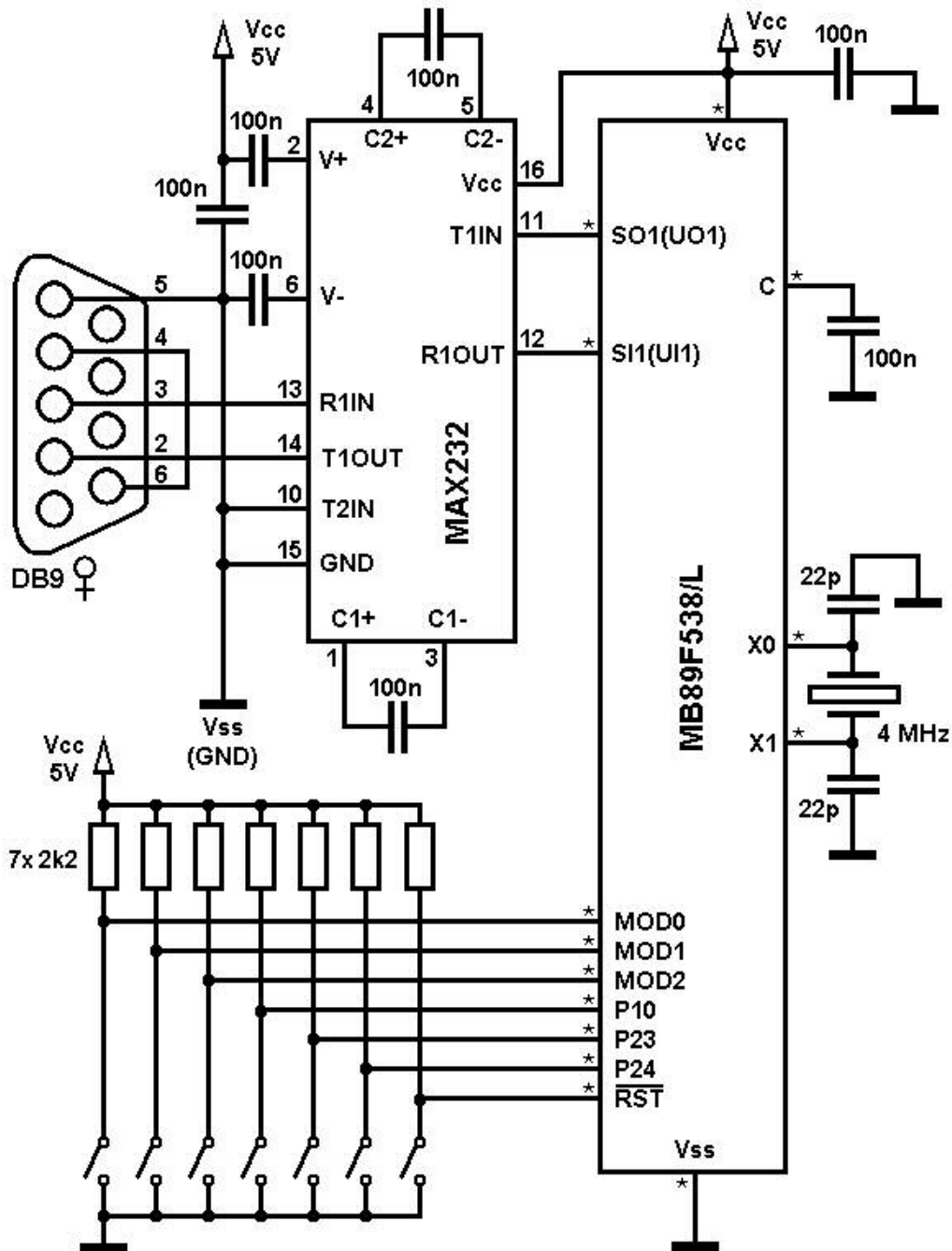
(FPT-64P-M09)

## 5 Example Schematic

### HARDWARE SETUP

#### 5.1 Setup for Programming

The following schematic gives an example for the hardware setup for programming the Flash Memory in serial asynchronous mode:



\* assignment depends on package