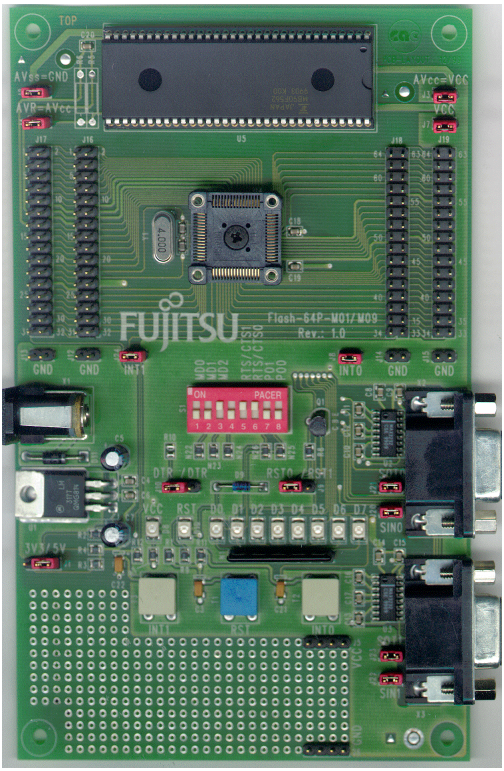
FUJITSU

Flash-64P-M01/M09
Evaluation Board
Documentation

Rev. 1.1



History

Revision	Date	Comment
V1.0	10.05.99	New Document
V1.1	09.07.99	History Table added on page 2, addendum 1 included in chapter 1.4.2

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Date: 22.01.99, V1.0

Contents

1. Hardware description

1.1 Overview

The Flash-64P-M01/M09 is a low cost multifunctional evaluation board for the Fujitsu 16-Bit Flash microcontroller series MB90560, MB90560L and MB90565. It can be used stand alone for software development and testing or as a simple target board to work with the emulator system.

The board allows the designer immediately to start with the software development before his own final target system is available.

1.2 Features

- Supports 16-Bit LX series MB90560, MB90560L, MB90565
- Fully supports 3V and 5V environment
- QFP-64 or DIP-64 package can be used
- In-Circuit serial Flash programming
- All resources available for evaluation
- All pins routed to connectors
- 4MHz main crystal
- Two UART Interfaces (3V and 5V operating)
- 8 User LEDs
- Reset Button
- Two Buttons configurable for external interrupts
- Prototyping area

1.3 General Description

The Flash-64P-M01/M09 was designed to support the MB90560/L series. It can be used as a stand alone evaluation board or as a target board for emulator debugger. The evaluation board supports two different packages:

- FPT-64P-M09 (square QPF64 package, 0,65mm pitch)
- DIP-64P-M01 (shrink DIP package)

Note: The board can only be mounted with one microcontroller. So never plug in two microcontrollers at the same time!

By default the board is working with a 4MHz crystal as the main oscillation clock, so internal clock rates up to 16MHz can be generated using the internal PLL of the µC. Two separate RS232 transceiverss can be used to connect directly the two on-chip UARTs to the 9 pin D-Sub connectors. The transceivers generate the adequate RS232 levels for the receive (RXD) and transmit (TXD) lines. The DTR line of the connector is hardwired to the DSR line. The RTS signal can be shortcut to CTS using the DIL switch setting. The UART1 interface (X3) is always used for the in-circuit serial programming of the MB90F562/L.
If the board is used as an emulator target board, the microcontroller must be removed from the socket and the corresponding probe cable has to be plugged in instead. For the FPT-64P-M09 package (64 pin QFP package), use the probe cable MB2132-461. For the DIP-64P-M01 package (64 pin DIL package), use the probe cable MB2132-434.
All pins of the Microcontrollers are connected to the edge connectors J16-J19. So all pins are directly available.

Note: The pin numbers of the connectors correspond to the pin numbers of the QFP socket only! For the DIL package please use the cross reference table at the end of this document.

The on-board line regulator allows to connect a regulated DC input voltage between +7.5V to +12V. In case of any modifications of the board, the user has to take care for the complete power consumption. To avoid any possible damages an additional heat sink for the line regulator can be mounted if necessary.
There are three push buttons on the board; one Reset button and two buttons which can be used for external interrupts.
Eight user LEDs are connected via a 1K pull up resistor network to Port 0. If this port is used for something else, the resistor network can be removed in order to disconnect the LEDs.
The operating mode of the microcontroller can be selected by the mode pin setting. This setting can be done by the DIP switch S1 located on the board.

1.4 Jumpers and Switches

This chapter describes all jumpers and switches which can be modified on the evaluation board. The default setting is shown with a gray shaded area. All jumpers and switches are named directly on the board by its meaning, so it is very easy to set the jumpers according to the features.

1.4.1 Define µC Operating Mode (DIP Switch S1)

The DIP switch S1 is used to set the operating mode of the µC and to configure the two serial interfaces. S1/1, S1/2 and S1/3 are used to set the three mode pins MD0, MD1, MD2 of the microcontroller. These mode pins define the operating mode of the µC. Make sure that the mode pin setting corresponds to the usage of the application. For more detailed information please look at the Hardware Manual of the microcontroller series. The default setting is used for 'Single Chip' normal mode.

	DIP switch setting	Logical value
MD0 (S1/1)	ON (closed)	0 (low)
	OFF (open)	1 (high)
MD1 (S1/2)	ON (closed)	0 (low)
	OFF (open)	1 (high)
MD2 (S1/3)	ON (closed)	0 (low)
	OFF (open)	1 (high)

Figure 1: S1 DIP switch setting to set the Mode Pins(default: MD0,1,2 = 110, single chip mode)

default

S1/7 and S1/8 are used to set the port pins P00 and P01. These two port pins are used to define the serial programming mode, if the In-Circuit serial programming of the Flash memory is used. For normal operation these port pins are used as general I/O ports.

Note: **The port pins P01 and P00 are connected to a 47K pull up resistor each.**

	DIP switch setting	Logical value
P01 (S1/7)	ON (closed)	0 (low)
	OFF (open)	1 (high)
P00 (S1/8)	ON (closed)	0 (low)
	OFF (open)	1 (high)

Figure 2: S1 DIP switch setting for the Port P00 and P01 (default: P01= 0FF, P00 = OFF)

1.4.2. Power Supply Voltage (J1, J7)

The evaluation board can be configured to work with +3.3V or +5.25V power supply voltage. So even the serial interfaces will work with +3.3V or +5.25V power supply.

Note: **The MB90F562 is a 5V only device. The MB90F562L is a 3V only device. For more detailed electrical characterisations please look at the corresponding datasheet.**

	DIP switch setting	Description
3V3/5V power Supply (J1)	1-2 (3V3)	On board power supply is 3.3V
	2-3 (5V)	On board power supply is 5.25V

Figure 3: J1 jumper setting for the Power Suppy voltage (default: 2-3(5V)=5.25V Power Supply)

NOTE:

If the evaluation board is used with the MB90560L or MB90565 series (low voltage series), the supply voltage for the µC must be switched to Vcc=3.3V(Jumper setting J1). Additional it is necessary to connect manually the C-Pin to Vcc by a wire. Otherwise it could happen that the µC does not work correctly! (C-Pin: Connector J 18/pin 57 for QFP package, Connector J17/pin1 for DIL package)

The Jumper J7 is used to connect the Vcc supply voltage to the µC. This jumper was assigned e.g. to measure the Icc current for the µC separately.

	Jumper setting	Descri ption
Vcc (J7)	ON (closed)	Power supply Vcc connected to µC
	OFF (open)	Power supply Vcc disconnected from the µC

Figure 4: J7 jumper setting for Vcc power Supply (default: J7= 0N)

1.4.3 Define External Interrupts INT0, INT1 (J8, J24)

J8 and J24 are used to connect the push buttons INT1 and INT0 to the external interrupts INT1 and INT0. The push buttons are connected to the external interrupts INT0 and INT1. Additionally a 10k/10µF RC low pass filter is used for both interrupt inputs to suppress glitches.

	Jumper setting	Description
INT0 (J8)	ON (closed)	INT0 connected to push button INT0
	OFF (open)	No connection
INT1 (J24)	ON (closed)	INT1 connected to push button INT1
	OFF (open)	No connection

Figure 5: J8, J24, Jumper setting to connect external interrupts (default: J8= 0N, J24 = ON)

To disconnect the low pass filter and the push buttons, just remove the corresponding jumper.

1.4.4 Configuration of the RS232 Interfaces (J20 - J23, S1)

J20 – J23 are used to connnect the two on board serial transceivers to the UART0 and 1 interface of the microcontroller. J20 and J21 are used to connect the UART0 interface, J22 and J23 are used to connect the UART1 interface. The jumpers are used to connect the TTL outputs (RXD, TXD) of the serial drivers to the µC. If the UART interface is not used, the corresponding jumpers should be left open.

	Jumper setting	Description
SIN0 (J20)	ON (closed)	SIN0 connected
	OFF (open)	No connection
SOT0 (J21)	ON (closed)	SOT0 connected
	OFF (open)	No connection

Figure 6: J20, J21 jumper setting for the Serial Interface (default: SIN0= 0N, SOT0 = ON)

	Jumper setting	Description
SIN1 (J22)	ON (closed)	SIN1 connected
	OFF (open)	No connection
SOT1 (J23)	ON (closed)	SOT1 connected
	OFF (open)	No connection

Figure 7: J22, J23 jumper setting for the Serial Interface (default: SIN1= 0N, SOT1 = ON)

Some DIP switches of switch S1 (S1/5 and S1/6) are used to shortcut RTS to CTS of the corresponding serial UART interface. S1/5 is used for the UART1 interface, S1/6 is used for UART0 interface. Especially for the serial download it is necessary to shortcut RST with CTS of UART1, otherwise a communication error will occur.

	DIP switch setting	Description
RTS/CTS 1 (S1/5)	ON (closed)	Shortcut RTS/CTS1
	OFF (open)	No shortcut
RTS/CTS 0 (S1/6)	ON (closed)	Shortcut RTS/CTS0
	OFF (open)	No shortcut

Figure 8: S1 DIP switch setting for the Serial Interface (default: RTS/CTS 1= 0FF, RTS/CTS 0 = OFF)

1.4.5 Reset Generation (J9, J10)

It is possible to use the DTR line of the UART interfaces to generate a reset for the evaluation board. Therfore the jumpers J9 and J10 are used. Jumper J9 is used to select whether the DTR line from UART1 or UART0 is used to generate a reset. Jumper J10 is used to invert the polarity of the DTR line. So just change the polarity for DTR if the reset is not generated correctly by DTR. To disconnect the reset logic, just remove the jumper J10.

Note: If a Reset is active, the red Reset LED is lit. During normal operation this LED should be off! If the reset LED is steadily on, change the DTR polarity and check the power supply input voltage.

	Jumper setting	Description
RST0 / RST1 (J9)	1-2 (RST0)	DTR of UART0 used to generate Reset
	2-3 (RST1)	DTR of UART1 used to generate Reset
DTR / /DTR (J10)	1-2 (DTR)	No polarity inversion for the DTR signal
	2-3 (/DTR)	Polarity inversion for the DTR signal

Figure 9: J9, J10 jumper setting for Reset Generation (default: RST0/RST1= 1-2, DTR/ /DTR = 1-2)

1.4.6 Configuration of the analog Interface (J2, J3, J4)

The jumpers J2, J3 and J4 are used to configure the analog interface. J2 is used to connect the analog ground AVss to the digital GND, J3 is used to connect the analog power supply voltage AVcc to Vcc. Via jumper J4 the analog reference voltage AVR can be selected.

	DIP switch setting	Description
J2 (AVss=GND)	ON (closed)	AVss = GND(Analog Ground = Digital Ground)
	OFF (open)	AVss disconnected
J3(AVcc =Vcc)	ON (closed)	AVcc=Vcc(Analog Voltage Supply = Digital Voltage supply Vcc)
	OFF (open)	AVcc not connected
J4(AVR=AVcc)	ON(closed)	AVR=AVcc(Analog Reference Voltage = Analog Supply voltage AVcc)
	OFF (open)	AVR defined by resistor network R5/R6

Figure 10: J2, J3, J4 jumper setting for the analog Interface (J2(AVss)=ON, J3(AVcc)=ON, J4(AVR=AVcc)=ON)

If J2 and J3 are open, the user has to take care to supply an adequate analog voltage supply AVcc and analog ground Avss to the analog interface. Otherwise the analog unit will not work correctly.
If J4 is set to OFF, the analog reference voltage AVR is defined by the resistors R5/R6. By default R5 and R6 are not mounted on the board and must be soldered by the user. The reference voltage itself can be calculated by AVR=AVcc*(R6/(R5+R6))

1.5 Serial Programming Interface

The Flash memory of the MB90560/L series can be programmed in-circuit via the serial UART1 interface. Therefore a special software PC frontend must be used which is available on the Fujitsu Micros CD-ROM.
To prepare the evaluation board for the serial programming the following settings must be done:

1. Power off the board
2. Connect the serial interface UART1 to your serial PC communication port. Therfore a straight cable connection has to be used.
3. Set the mode and port pins to the serial asynchronous programming mode (MD0, MD1, MD2 = 0,1,1; P01, P00 = GND). Shortcut RTS/CTS of the UART1 interface.

   Setting of the DIP switch S1:

S1	**S2**	**S3**	**S4**	**S5**	**S6**	**S7**	**S8**
ON	OFF	OFF	OFF	ON	OFF	ON	ON

4. Power on the board
5. Check that the Reset LED is off. Otherwise change the DTR polarity and check the power supply voltage.
6. Start the Flash programming software to download the program.
7. After downloading and programming of the Flash memory, switch off the power supply and

set the mode and port pins according to the usage of the application:
e.g. single chip mode:

Setting of the DIP switch S1:

S1	**S2**	**S3**	**S4**	**S5**	**S6**	**S7**	**S8**
OFF	OFF	ON	OFF	OFF	OFF	OFF	OFF

8. After power-on or Reset the user application is started directly.

In case of any errors check the following settings:
- Power supply (Jumpers J1, J7)
- Setting of DIP switch S1
- Connection of UART1 interface (Jumper J22, J23)
- Connection and polarity of DTR reset logic (Jumpers J9, J10)

1.6 Related Products

1.	Flash-64P-M01/M09	Evaluation board for MB90560/L Series
2.	MB2141A	Emulator debugger main unit
3.	MB2145-507	Emulation pod
4.	MB2132-461	Emulator probe cable for QFP package (FPT-64P-M09)
5.	MB2132-434	Emulator probe cable for SH-DIP package (DIP-64P-M01)
6.	MB90V560CR	Evaluation chip for emulator debugger
7.	MB90F562LPF	Flash Microcontroller 3V version, package FPT-64P-M09
8.	MB90F562LP-SH	Flash microcontroller 3V version, package DIP-64P-M01
9.	MB90F562PF	Flash microcontroller 5V version, package FPT-64P-M09
10.	MB90F562P-SH	Flash microcontroller 5V version, package DIP-64P-M01
11.	NQPACK-64SB	Socket for FPT-64P-M09,Tokyo Eletech Corp.
12.	HQPACK-64SB140	Header for Socket for FPT-64P-M09, Tokyo Eletech Corp.

1.7 Connectors

1.7.1 Edge connectors J16, J17, J18, J19

The following table shows the pinning of the edge connectors J16-J19. The pins of the QFP-64 and DIP-64 package are directly connected to these connectors. J16 and J17 are connected to the pins 1-32, J18 and J19 are connected to the pins 33-64 of the µC. The odd pin numbers are located on the one side and the even pin numbers are located on the other side of the connector. On the PCB, the corresponding pin numbers of the µC are written next to the connector pins.
Note: **The pin numbers next to the connectors correspond to the QFP-64 package only. For the DIP package use the following cross reference table**.

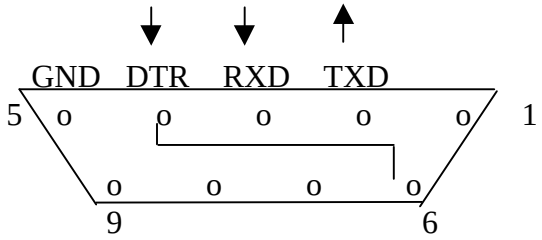
Connector-Pin cross reference table for QFP-64 and DIP-64 package

Connector J16/J18 (J17/J19)	µC Pin	QFP 64	µC Pin	DIL 64
1	1	P45/PPG4	9	P45/PPG4
2	2	P46/PPG5	10	P46/PPG5
3	3	P50/AN0	11	P50/AN0
4	4	P51/AN1	12	P51/AN1
5	5	P52/AN2	13	P52/AN2
6	6	P53/AN3	14	P53/AN3
7	7	P54/AN4	15	P54/AN4
8	8	P55/AN5	16	P55/AN5
9	9	P56/AN6	17	P56/AN6
10	10	P57/AN7	18	P57/AN7
11	11	AVCC	19	AVCC
12	12	AVR	20	AVR
13	13	AVSS	21	AVSS
14	14	P60/SIN1	22	P60/SIN1
15	15	P61/SOT1	23	P61/SOT1
16	16	P62/SCK1	24	P62/SCK1
17	17	P63/IN7/DTT1	25	P63/IN7/DTT1
18	18	MD0	26	MD0
19	19	RSTX	27	RSTX
20	20	MD1	28	MD1
21	21	MD2	29	MD2
22	22	X0	30	X0
23	23	X1	31	X1
24	24	VSS	32	VSS
25	25	P00	33	P00

26	26	P01	34	P01
27	27	P02	35	P02
28	28	P03	36	P03
29	29	P04	37	P04
30	30	P05	38	P05
31	31	P06	39	P06
32	32	P07	40	P07
33	33	P10/INT0	41	P10/INT0
34	34	P11/INT1	42	P11/INT1
35	35	P12/INT2	43	P12/INT2
36	36	P13/INT3	44	P13/INT3
37	37	P14/INT4	45	P14/INT4
38	38	P15/INT5	46	P15/INT5
39	39	P16/INT6	47	P16/INT6
40	40	P17/FRCK	48	P17/FRCK
41	41	P20/TIN0	49	P20/TIN0
42	42	P21/TO0	50	P21/TO0
43	43	P22/TIN	51	P22/TIN
44	44	P23/T01	52	P23/T01
45	45	P24/IN0	53	P24/IN0
46	46	P25/IN1	54	P25/IN1
47	47	P26/IN2	55	P26/IN2
48	48	P27/IN3	56	P27/IN3
49	49	VSS	57	VSS
50	50	P30/RTO0	58	P30/RTO0
51	51	P31/RTO1	59	P31/RTO1
52	52	P32/RTO2	60	P32/RTO2
53	53	P33/RTO3	61	P33/RTO3
54	54	P34/RTO4	62	P34/RTO4
55	55	P35/RTO5	63	P35/RTO5
56	56	VCC	64	VCC
57	57	C	1	C
58	58	P36/SIN0	2	P36/SIN0
59	59	P37/SOT0	3	P37/SOT0
60	60	P40/SCK0	4	P40/SCK0
61	61	P41/PPG0	5	P41/PPG0
62	62	P42/PPG1	6	P42/PPG1
63	63	P43/PPG2	7	P43/PPG2
64	64	P44/PPG3	8	P44/PPG3

1.7.2 Serial Interface connectors X2, X3

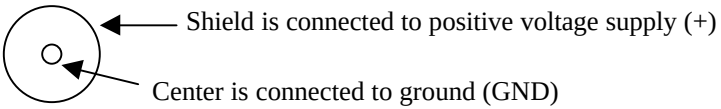
The following diagram shows the connection of the 9-pin D-Sub female connectors X2 and X3 which are used for the serial interfaces.



TXD is the transmit output, RXD is the receive input. The DTR signal is used as an input ,which can be connected to generate a reset.

1.7.3 Power connector X1

The following figure shows the power connection jack X1. This connector is used to connect an external regulated DC power supply voltage (7.5V-12V DC) to the evaluation board. It is recommended to use 7.5V to keep the power dissipation to a minimum. Otherwise an additional heat sink for the linear voltage regulator might be necessary.



2.0 Installation

Carefully remove the board from the shipping carton. Check first if there are any damages before power on the evaluation board.

Note: For the power supply a DC input voltage of about 7,5V is recommended. The positive voltage (+) must be connected to the shield, and ground (GND) must be connected to the centre of the connector X1!

After power-on, the green power-on LED should be on. If the LED is not on, switch off the power supply and check the default jumper settings.
By default the evaluation board is equipped with a MB90F562PF. Although the evaluation board supports two different packages, it is not allowed to mount two microcontrollers at the same time! Otherwise the microcontrollers and the evaluation board could be damaged! By default the Flash-memory of the microcontroller on the evaluation board has been programmed with a test program. So after power on a running light for the eight user LEDs can be seen. Furthermore a welcome string is continously output on both UART channels.
The in-circuit programming allows the user to program it's own application into the Flash-memory. How to program the Flash memory is described in chapter 1.5, Serial Programming Interface.

If the board is used as an emulator target board, switch off the power supply and remove the microcontroller from the socket. Now the probe cable can be mounted into the socket. Take care of pin 1 marking onto the socket and fix the probe cable with screws (probe cable for QFP-64 package only). Connect the probe cable now to the emulation pod. Check all DIP swich settings of the evaluation board and the emulation pod before the power-on of the system.
For the power on sequence the emulator system must be switched on first, after that, switch on the evaluation board. For the emulator setup, please look at the corresponding user manuals for the emulator system. After the power on sequence, the reset LED of the emulator must be off and the Vcc LED must be on. If the Reset LED is still on check the DIP switch setting of the emulator system and the power supply of the evaluation board.

3. Schematics and Drawings

3.1 Top Assembly Flash-64P-M01/M09 evaluation board

3.2 Schematics of Flash-64P-M01/M09 evaluation board