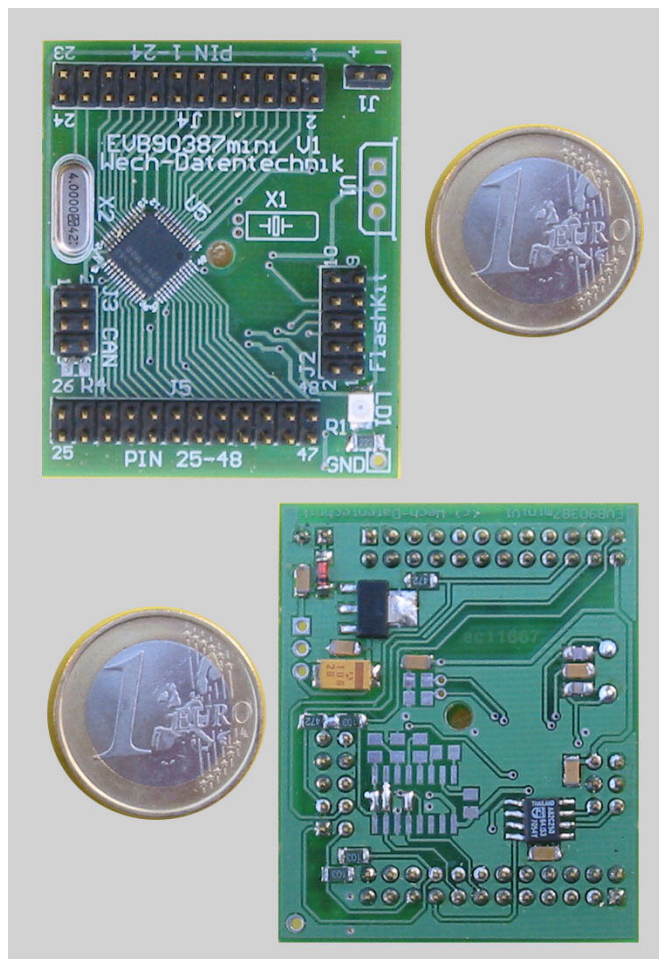


EVB90387mini

Documentation

(DocRev: 2.0 - BoardRev:2.0)

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Garantie

Dieses Evaluierungs-Board und alle weiteren Lieferbestandteile,
sowohl Hard- als auch Software,
werden nur für den Laboreinsatz bereitgestellt.
Es wird keine Garantie für Schäden an Geräten und Personen übernommen,
die durch den Einsatz des Evaluierungs-Board entstehen.

Warranty and Disclaimer

This Evaluation-Board and all its deliverables,
hardware as well as software,
are intended and must only be used in an evaluation laboratory environment.
No Guarantee will be overtaken for any damage of any part or person,
that will occur as a result of this Evaluation-Board.

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1. Overview

1.1. Abstract

The EVB90387mini is a low cost evaluation board for Fujitsu's 16-Bit Flash microcontroller MB90F387 (with CAN) or the CANless derivatives of the MB90455series. It can be used as a stand alone system for software development or it can be mounted like a piggy-board on other hardware.

1.2. Features

- ▶ Supports 16-Bit MB90385series (with CAN) and MB90455series (without CAN)
e.g. MB90F387(S), MB90F455(S), MB90F456(S), MB90F457(S)
- ▶ LQFP-48 package can be used (FPT-48P-M26)
- ▶ 8-12V unstabilized external DC power supply
- ▶ 5V Regulator on-board,
- ▶ Selectable "Power-On" or "User-"-LED
- ▶ In-Circuit serial Flash programming (asynchronous & synchronous)
- ▶ All resources available for evaluation
- ▶ All 48pins are routed to connectors
- ▶ 4 MHz main crystal, optional 32.768KHz Sub-clock
- ▶ One UART Interfaces (RS232 Transceiver on board)
- ▶ One High-Speed CAN Transceiver (only with MB90F387)
- ▶ 10pin Programming Socket (FlashKit)

The target board will be delivered with the MB90F387 Flash-ROM microcontroller. This microcontroller contains the 'burn-in'-boot loader for programming the flash.

**This board must only be used for test applications
in an evaluation laboratory environment.**

1.3. General Description

The EVB90387mini is designed to support the Fujitsu MB90385series (with CAN) and MB90455series (without CAN).

By default the board is supplied with a 4MHz crystal as the main oscillation clock. Using the internal PLL of the μ C, internal clock rates up to 16MHz can be achieved. Please refer to the Datasheet of the MB90385 or MB90455 series for details.

The connector J2 collects all signals that are necessary for programming the chip, like UART-, Reset- and Mode-signals. Further, +5V is available, e.g. to power an external RS232-transceiver. The pin-out of J2 is same as it is standard from Fujitsu, like for the FlashKit-Tool or Conitec's Galep IV with ISP-adapter.

A separate RS232 transceiver generates the adequate RS232 levels for the receive (RXD), transmit (TXD) and optional Reset (DTR or RTS) lines. Instead of the RS232 transceiver the TXD, RXD and Reset lines can be bridged (JP1-3) if TTL-level wants to be used.

Depending on the mode-settings the Flash-microcontroller can be programmed in-circuit synchronously or asynchronously.

All pins of the Microcontrollers are connected to the edge connectors J4 and J5 and are directly available for the user.

The on-board voltage regulator allows the user to connect an unregulated DC input voltage between +8V to +12V. In case of any modifications of the board, care should be taken that the total power consumption will not damage the regulator.

2. Installation

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

Note:

For the power supply a DC input voltage of 8V – 12V is recommended. The positive voltage (+) must be connected to pin 1 of the connector J1, Ground (GND) must be connected to pin 2!

The evaluation board is equipped with a Flash-Controller MB90F387 and the device is programmed with a test software. So after power-on a welcome string is continuously output via the UART1 (9600 baud).

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 4.

2.1. Software

Example-projects can be downloaded from the following locations:

Fujitsu-Microelectronics: www.fme.gsdc.de/gsdh.htm

WECH-Datentechnik: www.holgerium.de/wech-datentechnik

3. Jumpers and Switches

This chapter describes all jumpers and switches which can be modified on the evaluation board. The default settings are shown with a grey shaded area.

All jumpers and switches are named directly on the board, so it is very easy to set the jumpers according to the features.

3.1. RS232-transceiver (JP1, JP2, JP3)

JP1-JP3:

If JP1-JP3 are set no RS232-transceiver can be assembled. In this case the UART-lines will work with TTL-level. This might be necessary for synchronous-programming, e.g. Flash-Kit-tool or for asynchronous programming, if an external RS232-transceiver will be used.

Jumper	Setting	Description
JP1-JP3	open	TXD, RXD and external Reset use RS232-level (U2 has to be assembled)
	close	TXD, RXD, Reset use TTL-level (U2 has not to be assembled)

3.2. CAN-transceiver (R9)

R9:

The resistor R9 allows slope control of the CAN-transceiver. Normally this resistor is bridged within the layout. This means pin RS of the CAN-transceiver is connected to ground for high-speed operation. If this hardware bridge will be cut and replaced by assembling the resistor R9 then the CAN-transceiver can be used for low-sleep or stand-by operation.

Jumper / Resistor	Setting	Description
R9	shortcut	High-speed operation of CAN-transceiver
	R9	Low-speed or standbymode of CAN transceiver

For details please see the datasheet of the CAN-transceiver PCA82C250

CONDITION FORCED AT PIN Rs	MODE	RESULTING VOLTAGE OR CURRENT AT PIN Rs
$V_{Rs} > 0.75V_{CC}$	standby	$I_{Rs} < 10 \mu A $
$-10 \mu A < I_{Rs} < -200 \mu A$	slope control	$0.4V_{CC} < V_{Rs} < 0.6V_{CC}$
$V_{Rs} < 0.3V_{CC}$	high-speed	$I_{Rs} < -500 \mu A$

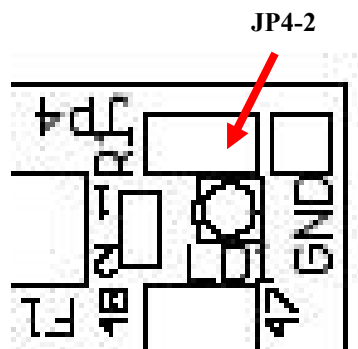
3.3. „Power-“ or „User-“ LED (LD1, JP4)

The LED LD1 can be used as “Power-LED” as well as “User-LED”.

If jumper JP4 is closed, then the LED will lit if the board is powered up.

If jumper JP4 is open, then any I/O-port of the microcontroller (see chapter 5.3, connector J4 and J5) can be wired to JP4-2 in order to switch on/off the LED by I/O-functionality of the microcontroller.

Jumper	Setting	Description
JP4	closed	LED LD1 is “Power-LED”
	open	LED LD1 is “User-LED”
JP4-2	Connected to MCU I/O	If MCU-I/O is high then “User-LED” is on If MCU-I/O is low then “User-LED” is off



4. Programming the internal Flash

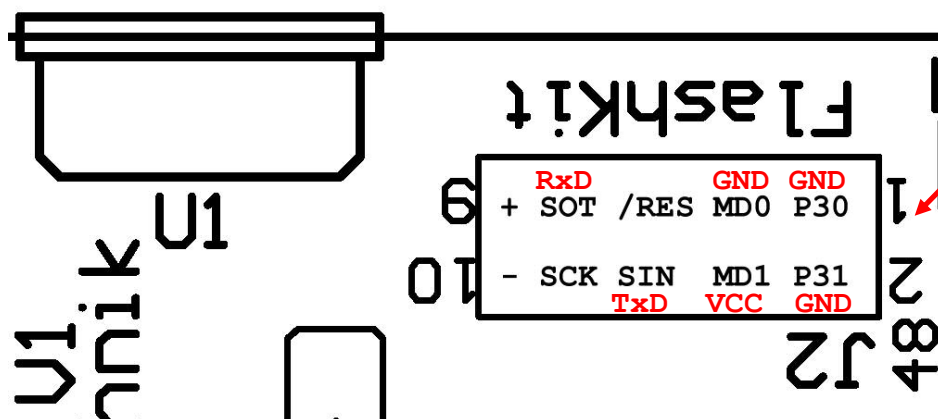
All Flash-devices of the MB0385 and MB90455 series have an internal bootloader for asynchronous- as well as synchronous- Flash-programming. Both modes will use the UART1(SIO1).

4.1. Asynchronous Mode

In order to program the Flash-ROM asynchronously via UART1, the Fujitsu MCU-Flash-Programmer can be used. This tool is available for free on the Fujitsu Micros CD-ROM or Web Site (www.fme.gsdc.de/gsd.htm: select → Software → Utilities)

The following procedure must be followed to enable Flash Programming:

- (1) Power off the board
- (2) Connect the Evaluation Board UART 1 to your serial PC communication port:
 - Connect **J2-6 to TxD** of the COM-port (SUB-D9 Pin 3)
 - Connect **J2-7 to RxD** of the COM-port (SUB-D9 Pin 2)
 - Please refer to chapter 3 for right settings of JP1-JP3.
- (3) Select the asynchronous Boot-mode:
 - Connect J2-1 (P30) to GND (this might already be done by pull-down resistor R5)
 - Connect J2-2 (P31) to GND (this might already be done by pull-down resistor R6)
 - Connect **J2-3 (MD0) to GND**
 - Connect **J2-4 (MD2) to VCC**
- (4) Power on the board
- (5) Start the Fujitsu MCU-Flash-Programmer software and follow the instructions
- (6) After programming the Flash-ROM, power off the board
- (7) Set the mode back to the Single Chip-Mode: Disconnect J2-1, J2-2, J2-3, J2-4
The right mode setting (MD2..0='011') is done by resistors (R7, R8)
- (8) Power on the board. The user application is started directly.



4.2. Synchronous Mode

In order to program the Flash-ROM synchronously via UART1 (SIO1) a special software has to be used, e.g. Fujitsu 'FlashKit' or Conitec's GalepIV with ISP-adapter. These tools are not available for free.

Please contact Fujitsu's Web Site:

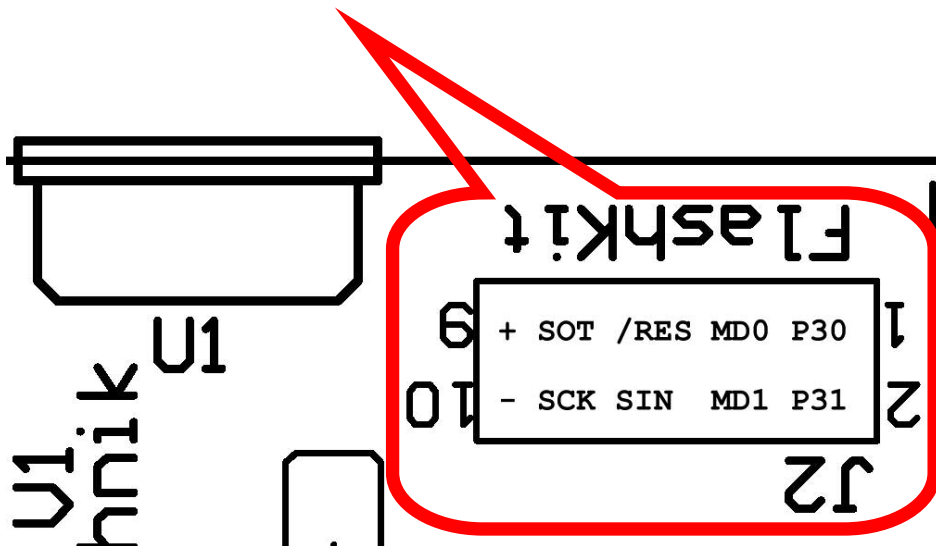
www.fme.gsdc.de/gsd.htm: select Tools → Programme → MCU FlashKit

or contact Conitec's Web Site:

<http://www.conitec.de>: Look for Galep IV

A dedicated Flash programming socket (J2) is provided on the EVB90387mini for direct connection to the synchronous programmer tools.

In this case all Mode-settings will be done automatically by the synchronous programmer.



Please refer to the manual of the synchronous programmer tools (e.g. Fujitsu's FlashKit, Conitec's GalepIV) for more information how to program a Flash-device by the synchronous-serial mode.

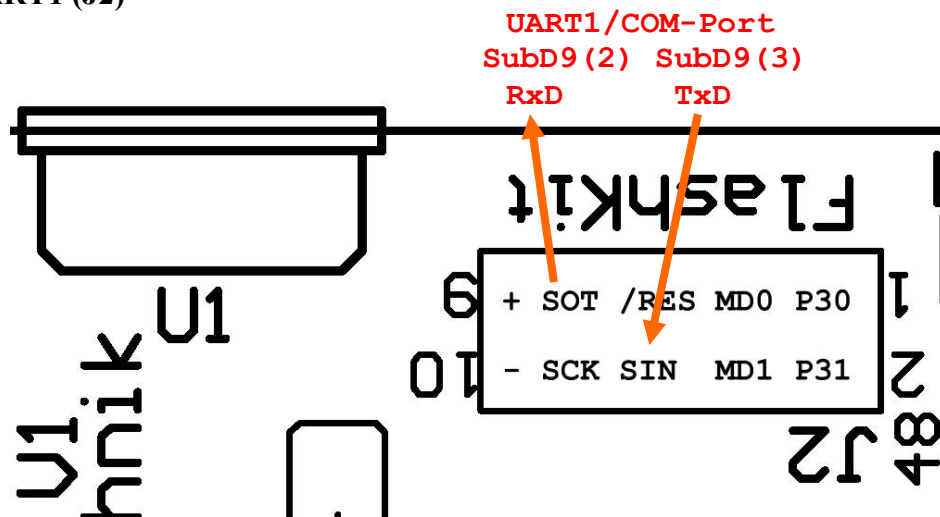
Note:

In case that another Programming-Tool is used and the Mode-settings have to be done manually then use the following configuration in order to select the synchronous-serial Flash-programming mode:

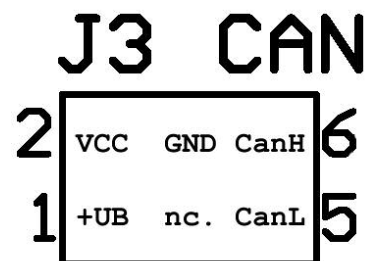
MD1='1' MD0='0' P31='1' P30='0'

5. Connectors

5.1. UART1 (J2)



5.2. CAN (J3)



5.3. MCU-Pins (J4, J5)

All pins of the microcontroller are available on J4 and J5 as follows:

Connector	MCU Pins
J4 (1 – 24)	1 – 24
J5 (25 – 48)	25 – 48

7. Partlist

Designator	Part Type	Footprint	Remarks
C1	100nF	C_0805	
C2	100nF	C_0805	
C3	100nF	C_0805	
C4	100nF	C_0805	
C5	100nF	C_0805	
C6	100nF	C_0805	
C7	100nF	C_0805	
C8	100nF	C_0805	
C9	100nF	C_0805	
C10	100nF	C_0805	
C11	10uF	C-C	
C12	22pF	C_0805	Only if X1 is mounted (Sub-clock)
C13	22pF	C_0805	Only if X1 is mounted (Sub-clock)
C14	22pF	C_0805	
C15	22pF	C_0805	
D1	1N4001	D-SOD80C	
J1	2pin header	HDR1X2	DC-in
J2	2x5pin header	HDR2X5	FlashKit
J3	2x3pin header	HDR2X3	CAN
J4	2x12pin header	HDR2X12 (1-24)	PIN 1-24
J5	2x12pin header	HDR2X12 (25-48)	PIN 25-48
JP1	Solder jumper	JP-2-SMD	Reset-Jumper
JP2	Solder jumper	JP-2-SMD	SOT-Jumper
JP3	Solder jumper	JP-2-SMD	SIN-Jumper
JP4	2pin jumper	JP-2	"Power-LED", JP4-2 = "User-LED"
LD1	LED	D-TOPLED	Power LED
R1	1k5	R_1206	
R2	47k	R_0805	
R3	47k	R_0805	
R4	t.b.d	R_0805	CAN-Termination
R5	10k	R_0805	Pull-down for P30
R6	10k	R_0805	Pull-down for P31
R7	4k7	R_0805	
R8	4k7	R_0805	
R9	0 by wire (or cut and assemble R9. See chapter3.2)	R_0805	Slope control of CAN-transceiver
U1	7805	IC78XX	Instead of U1, U2 can be mounted
U2	TLE4264	SOT-223	Instead of U2, U1 can be mounted
U3	MAX232ACSE(16)	SO-16	Instead of U3, JP1-3 can be closed
U4	PCA82C250	SO-8	
U5	MB90F387	FPT-48P-M26	
X1	32,7kHz	HC16/U	Sub-clock (optional)
X2	4MHz	HC18/U	

8. Revision and Error List

The following bugs have been found with the board and need to be observed when working with this tool:

Date	Revisions – Errors	Board	Doc
25.09.2003	First Release	1.0	1.0
26.07.2004	Second Release (CAN slope control, “User-LED”)	2.0	2.0