EVB-MB90F387

Documentation

(DocRev: 2.0 - BoardRev:2.0)

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 demage of any part or person,
that will occurre as a result of this Evaluation-Board.

Contents

1. Overview

1.1. Abstract

The EVB-MB90F387 is a low cost multifunctional evaluation board for the Fujitsu 16-Bit Flash microcontroller MB90385series. 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 MB90385series, e.g. MB90F387, MB90F387S
- LQFP-48 package can be used (FPT-48P-M26)
- 9-12V unstabilized external DC power supply
- 5V Regulator on-board, “Power-On”-LED
- In-Circuit serial Flash programming (asynchronous & synchronous)
- All resources available for evaluation
- All pins routed to connectors
- 4 MHz main crystal, optional 32.768KHz Sub-clock
- One UART Interfaces (RS232 Transceiver on board)
- One High-Speed CAN Transceiver
- 8 User LEDs + 1 User-Button for external interrupt
- Reset Button + “Reset” LED
- FlashKit Programming Socket
- Two LCD-sockets to connect one alphanumeric LC-Display

The target board will be delivered with the MB90F387(S) 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 EVB-MB90F387 is designed to support the Fujitsu MB90385series.

By default the board is supplied with a 4MHz crystal in a socket as the main oscillation clock. Using the internal PLL of the µC, internal clock rates up to 16MHz can be achieved (Please refer to the Datasheet of the MB90385series).

One separate RS232 transceiver is available to connect the on-chip UART to the 9-pin D-Sub connector (J3). The transceivers generates the adequate RS232 levels for the receive (RXD) and transmit (TXD) lines. The RXD and TXD lines may be swapped by Jumpers (JP16) for use with crossed or non-crossed cable.
The DTR line or the RTS line of the connector can be configured (JP18) to reset the microcontroller.
The Flash Programming Socket (J5) can be used for in-circuit-synchronous programming of the Flash-Controller (Please refer to the FlashKit-Tool offered by Fujitsu Microelectronics)
Asynchronous flash programming is possible via UART (J3).

All pins of the Microcontrollers are connected to the edge connectors J1A and J1B and are directly available to the user.

The on-board voltage regulator allows the user to connect an unregulated DC input voltage between +9V to +12V. In case of any modifications of the board, care should be taken that the total power consumption will not damage the regulator.

There are two push button switches on the board, one for Reset and one for an external Interrupt (Int4).

Eight user-LEDs are connected via a 1.5K pull up resistor network to I/OPorts. If these LEDs are not required, the resistor network can be removed to disconnect the LEDs and to free the port.

The operating mode of the microcontroller can be selected by the jumpers JP13-JP15.

2. 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 9V – 12V is recommended. Ground (GND) must be connected to the shield, and the positive voltage (+) must be connected to the centre of the connector J4!

The evaluation board is equipped with a Flash-Controller and the device 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 continuously output with 9600 baud 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 4.

2.1. Software

Example-projects can be downloaded from the locations:

Fujitsu homepage ➔ www.fme.gsdc.de/gsdc.htm

My homepage ➔ www.wech-datentechnik.de.vu

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. Operating- and Flash-Programming Mode (JP4, JP5, JP13, JP14, JP15)

JP13-15:
Ensure that the mode pin settings correspond to the operation-mode of the application.
In general two modes are important:
Single-Chip-Run-mode (default) / Programming-mode (Please see chapter 4)

Jumper	Setting	Logical value
JP15 (MD0)	ON (closed)	0 (low)
	OFF (open)	1 (high)
JP14 (MD1)	ON (closed)	0 (low)
	OFF (open)	1 (high)
JP13 (MD2)	ON (closed)	0 (low)
	OFF (open)	1 (high)

JP4, JP5:
The two port pins P30 and P31 are used to define the serial Flash-programming-mode, if the internal bootloader is used. For normal operation these port pins are used as general I/O ports and will control two user-LEDs of the evaluation-board.

Jumper	Setting	Logical value
JP4 (P31)	ON (closed)	1 (high)
	OFF (open)	0 (low)
JP5 (P30)	ON (closed)	1 (high)
	OFF (open)	0 (low)

Note:
Please refer to the Hardwaremanual of the microcontroller to get more information about the usage of the Mode-pins.

3.2. Power Supply Voltage (JP3)

JP3: This Jumper is used to connect the Vcc supply voltage to the µC.
Connecting an Ampere-meter instead of setting the jumper allows measuring of the power-supply-current of the microcontroller (Icc).

Jumper	Setting	Description
Vcc (JP3)	ON (closed)	Power supply Vcc connected to µC
	OFF (open)	Disconnected from Power supply Vcc

3.3. Configuration of the Analogue-converter (JP1, JP2)

The MB90385series has one 8-channel 8/10-bit A/D-converter.
The power supply and the positive-reference voltage can be supplied via jumpers.

JP1: Connect the A/D-reference voltage (AVR+) to AVcc
JP2: Connect the A/D-power supply voltages (AVcc) to Vcc

Jumper	Setting	Description
JP1 (AVR+)	ON (closed)	AVR+ is connected to AVcc
	OFF (open)	AVR+ is disconnected from AVcc
JP2(AVcc)	ON (closed)	AVcc is connected to Vcc
	OFF (open)	AVcc is disconnected from Vcc

Note:
If JP1 and/or JP2 are open, the user has to supply seperately an adequate analogue voltage supply (AVcc and AVR+) to the A/D-converter

3.4. Configuration of the RS232-Interfaces (JP6, JP7, JP16, JP18)

On the MB90385series one UART is available. On the Evaluation-board jumpers interface the µC to an RS232-transceiver in order to generate the adequate RS232 levels.
The data-lines RXD and TXD can be swapped by JP16 for the use with a crossed or a non-crossed serial cable.
The microcontroller also can be reset by the UART if jumper JP18 is set.
If the UART interface is not required, the corresponding jumpers should be left open.

JP6, JP7: connect UART1 to the RS232-Transceiver (J3)
If the RS232-Transceiver interface is not used, the jumpers should be left open.

JP18: The DTR-line or the RTS-Line of the external Terminal can be used to generate a microcontroller-reset.

Jumper	Setting	Description
JP6 (TxD)	ON (closed)	SOT1 is connected to RS232-Transceiver
	OFF (open)	SOT1 is disconnected from RS232-Transceiver
JP7 (RxD)	ON (closed)	SIN1 is connected to RS232-Transceiver
	OFF (open)	SIN1 is disconnected from RS232-Transceiver
JP18 (RxD)	1-2	DTR is selected for external Reset-generation
	2-3	RTS is selected for external Reset-generation

3.5. CAN Interface (JP8, JP9, JP17)

One high-speed CAN-transceiver is available on the EVB-MB90F387-board.

JP8, JP9: connect CAN to the CAN-physical Layer Transceiver (J2)
If the CAN interface is not used, the jumpers should be left open.

JP17: enable CAN-Bus termination

Jumper	Setting	Description
JP8	Open	TX is unconnected
	Closed	TX connected to CAN (J2)
JP9	Open	RX unconnected
	Closed	RX connected to CAN1 (J2)
JP17	Open	CAN Bus is not terminated
	Closed	CAN Bus is terminated

3.6. Sub-Clock (JP10, JP11)

Two different devices are available within the MB90385series:

90F387 Dual-clock version will use sub-clock at X0A, X1A

90F387_S Single-clock version does not support sub-clock,
but has two additional I/O-pins (P35, P36) instead of X0A, X1A

The EVB-MB90F387 evaluation board supports both types.

JP10: Connect X1A to sub-clock crystal

JP11: Connect X0A to sub-clock crystal or to GND

Jumper	Setting	Description
JP10	Open	X1A is disconnected from crystal (no sub-clock is used)
	Closed	X1A is connected to crystal (sub-clock is used)
JP11	1-2	X0A is connected to crystal (sub-clock is used)
	2-3	X0A is connected to GND (dual-clock device but no usage of sub-clock

The default-settings depend on the device-type of the Controller that is assembled on the board.

Note:
If the Dual-clock version is used, but no sub-clock wants to be used, than X0A has to be connected to GND and X1A has to be left open.

4. Programming the internal Flash

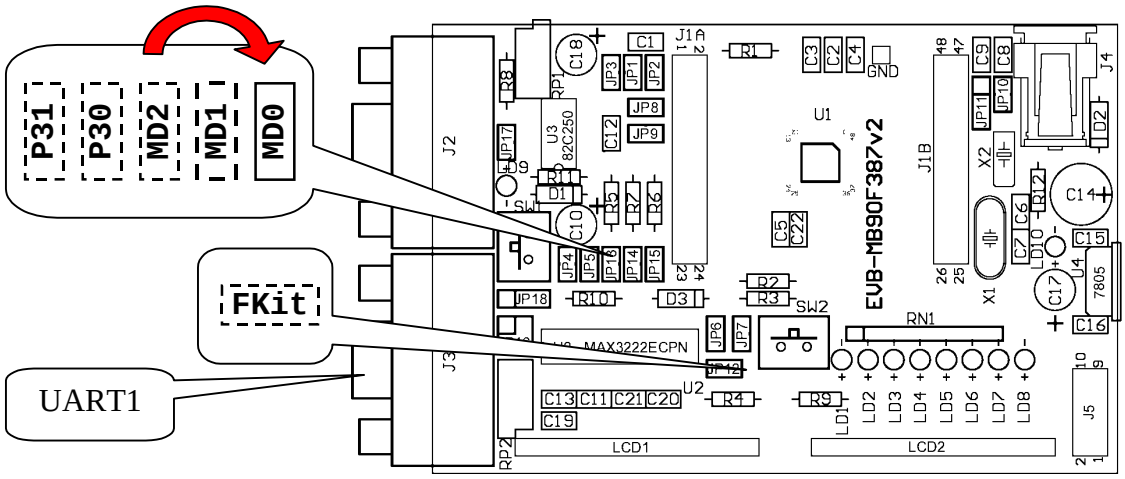
All Flash-devices of the MB90385series have an internal bootloader for asynchronous- as well as synchronous- Flash-programming. Both modes will use the UART1(SIO1).

4.1. Asynchronous Mode

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

The following procedure must be followed to enable Flash Programming:

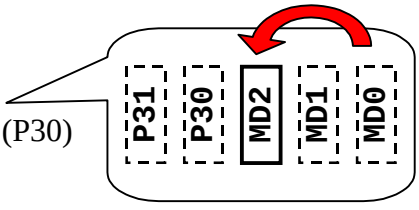
(1) Power off the board
(2) Connect the Evaluation Board UART 1 to your serial PC communication port.
(3) Configure UART1: JP5 and JP6 have to be set (see chapter 3.5)
(4) Configure the mode:
Close Jumper: JP15 (MD0)
Open Jumper: JP13 (MD2), JP14 (MD1), JP4 (P31), JP5 (P30)



(5) Power on the board
(6) Start the Flash-Memory-Writer software and follow the instructions

(7) After programming the Flash-ROM, switch off the power supply and set back the mode according to the usage of the application, e.g.: Single Chip-Mode:

Close Jumper: JP13 (MD2)
Open Jumper: JP15 (MD0), JP14 (MD1), JP4 (P31), JP5 (P30)



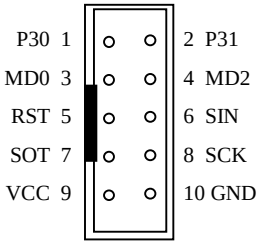
(8) Power on the board. The user application is started directly.

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' Tool. This tool is not available for free.
Please contact Fujitsu's Web Site:
www.fme.gsdc.de/gsdc.htm: select Tools → Programme → MCU FlashKit

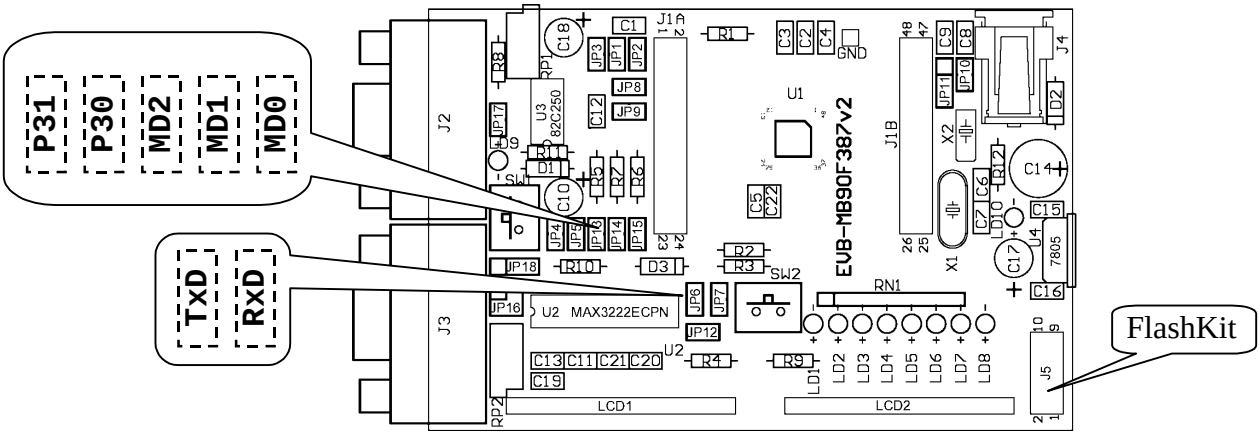
A dedicated Flash programming socket (J5) is provided on the EVB-MB90F387 for direct connection to the Fujitsu 'FlashKit'.

5: Flash programming socket



In case that the FlashKit-Tool is used, all Mode-settings will be done automatically by the FlashKit. This means that all Mode-jumpers have to be opened.

Open Jumper: JP15 (MD0), JP14 (MD1), JP13 (MD2), JP4 (P31), JP5 (P30)
JP6(TxD), JP7 (RxD)



Please refer to the manual of the FlashKit 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:

Open Jumper: JP14 (MD1), JP13 (MD2), JP5 (P30)
Close Jumper: JP15 (MD0), JP4 (P31)

5. Connectors

5.1. Edge connector (J1A, J1B)

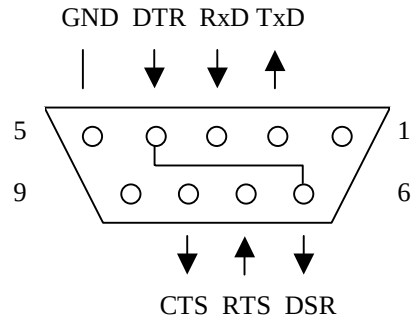
All pins of the microcontroller are directly connected J1A and J1B as follows:

Connector	MCU Pins
J1A (1 – 24)	1 – 24
J1B (25 – 48)	25 – 48

5.2. UART1 (J3)

The following diagram shows the connection of the 9-pin D-Sub female connector J3 that is used for the serial interfaces UART1.

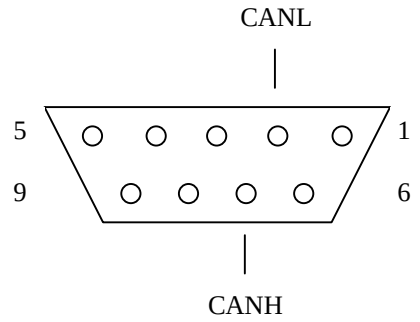
TXD is the transmit output.
RXD is the receive input.
Both signals can be swapped by JP16.
The DTR or RTS signal is used as an input, which can be connected to generate a reset.



5.3. CAN Interface connector (J2)

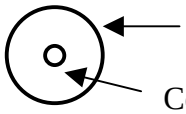
The following diagram shows the connection of the 9-pin D-Sub male connector J2 that is used as the CAN interface.

The slew-rate of the CAN-transceiver is set to maximum by a wire-bridge. Instead of connection a resistor trimmer RP1 can be assembled to adjust the slew-rate adequate to the local environment (CAN network configuration, transfer rate).



5.4. Power connector (J4)

The following figure shows the power connection jack J4. This connector is used to connect an external unregulated DC power supply voltage (9V-12V DC) to the evaluation board.



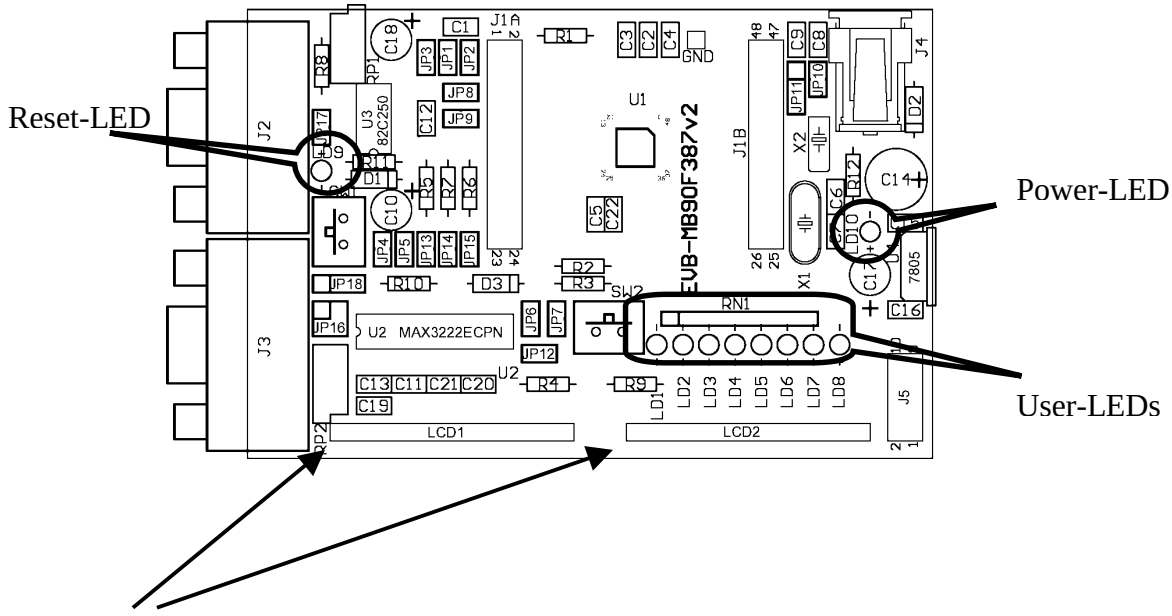
Shield is connected to ground (GND)

Centre is connected to positive voltage supply (+)

Note:
It is recommended to use 9V to keep the power dissipation to a minimum. Otherwise an additional heat sink for the linear voltage regulator might be necessary.

5.5. User-LEDs & LC-Display (LCD1, LCD2)

Eight LEDs are reserved for user-application. In order to disconnect the LEDs from the related microcontroller port, the resistor network RN1 can be removed. Instead of the user-LEDs one alphanumeric LC-Display can be connected to EVB-MB90F387 evaluation-board. Either connector LCD1 or LCD2 can be choosen for the connection. The position of the connectors is the only difference. **Do not connect two LC-Displays !**
The following control-signals are reserved:



	1	2	3	4	5	6	7	8	9	10	11	12	13	14
LCD	GND	VCC	V0	RS	R/W	E	-	-	-	-	D3	D4	D5	D6
LED				LD1	LD2	LD3	LD4				LD5	LD6	LD7	LD8
MCU				Pin31	Pin32	Pin33	Pin34				Pin42	Pin43	Pin44	Pin45
Port				P12	P13	P14	P15				P30	P31	P32	P33

6. Silk-Plot of the Board

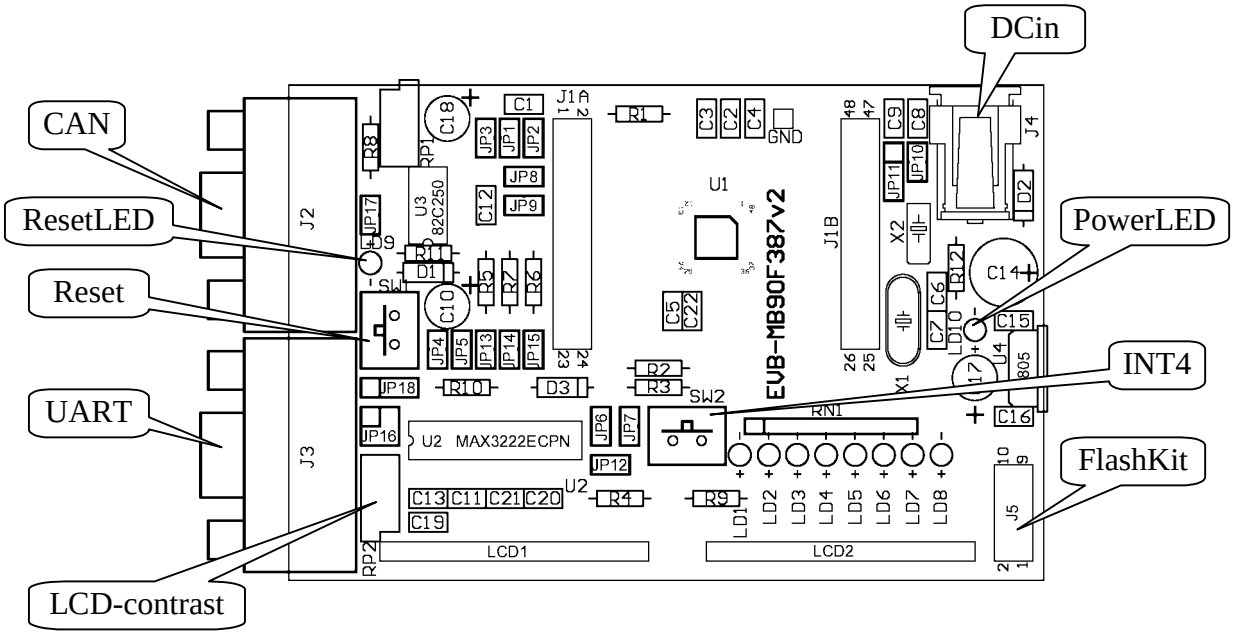


Figure 6.1: Silk-Plot with Jumper-number JPxx

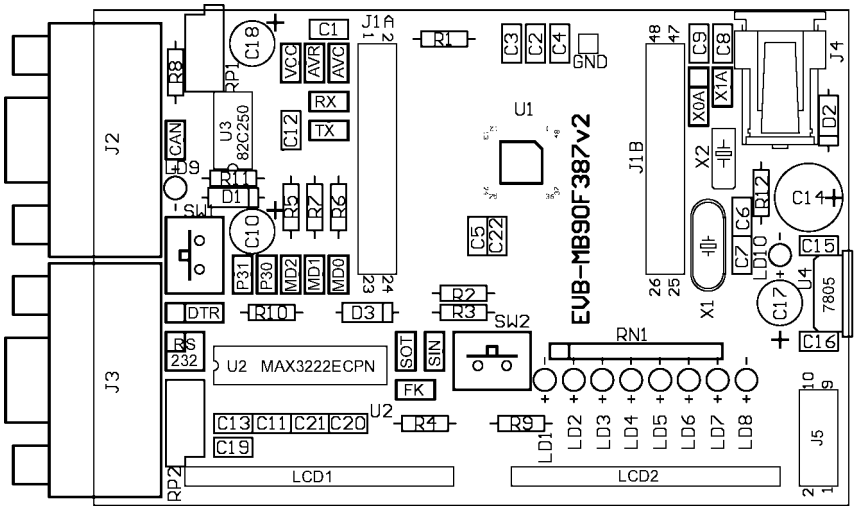


Figure 6.1: Silk-Plot with Jumper-name (e.g. MD0)

7. Partlist

Comment	QTY														Footprint
10uF	2	C18	C17												C_BECHER 0.1/6MM
1uF	1	C10													C_BECHER 0.1/6MM
100uF	1	C14													C_BECHER 0.1/9MM
100nF	12	C22	C21	C20	C19	C16	C15	C13	C12	C11	C5	C4	C2	C1	C_CER-0.1
22pF	4	C9	C8	C7	C6										C_CER-0.1
10n	1	C3													C_CER-0.1
UART1	1	J3													DB-9RA/F
CAN	1	J2													DB-9RA/M
1N4148	2	D3	D1												DIODE-0.4
1N4001	1	D2													DIODE-0.4
MAX3222ECPN	1	U2													DIP-18
PCA82C250	1	U3													DIP-8
MB90F387	1	U1													FPT-48P-M26
32,7kHz	1	X2													HC16/U
4MHz	1	X1													HC18/U
CON24	1	J1A													HDR2X12 (1-24)
CON24	1	J1B													HDR2X12 (25-48)
CON10	1	J5													HDR2X5
(CAN)	1	JP17													JP-2
(MD0)	1	JP15													JP-2
(MD1)	1	JP14													JP-2
(MD2)	1	JP13													JP-2
(X1A)	1	JP10													JP-2
(TX)	1	JP9													JP-2
(RX)	1	JP8													JP-2
(SIN)	1	JP7													JP-2
(SOT)	1	JP6													JP-2
(P30)	1	JP5													JP-2
(P31)	1	JP4													JP-2
(Vcc)	1	JP3													JP-2
(AVcc)	1	JP2													JP-2
(AVR)	1	JP1													JP-2
(FlashKit)	1	JP12													JP-2
(DTR)	1	JP18													JP-3
(X0A)	1	JP11													JP-3
(RS232)	1	JP16													JP-4
KLINKE	1	J4													KLINKE
LCD14	2	LCD1	LCD2												LCD
LED	10	LD10	LD9	LD8	LD7	LD6	LD5	LD4	LD3	LD2	LD1				LED3S
47k	2	R10	R4												R_AXIAL-0.4
22k	1	R9													R_AXIAL-0.4
RES	1	R8													R_AXIAL-0.4
4k7	3	R7	R6	R5											R_AXIAL-0.4
100k	2	R3	R2												R_AXIAL-0.4
1K5	2	R12	R11												R_AXIAL-0.4
10	1	R1													R_AXIAL-0.4
10k	1	RP2													R_POTI5
R_POTI	1	RP1													R_POTI5
RN8X1	1	RN1													RN8x1
Reset / INT	2	SW2	SW1												SW-PB
7805	1	U4													TO-220

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
14.08.02	First Release	1.0	1.0
14.08.02	Board Rev:2.0 Power- and Reset-LED added, MDx-Jumper moved	2.0	2.0