PCAN-MicroMod Evaluation

Test and Development Environment
for the PCAN-MicroMod

User Manual
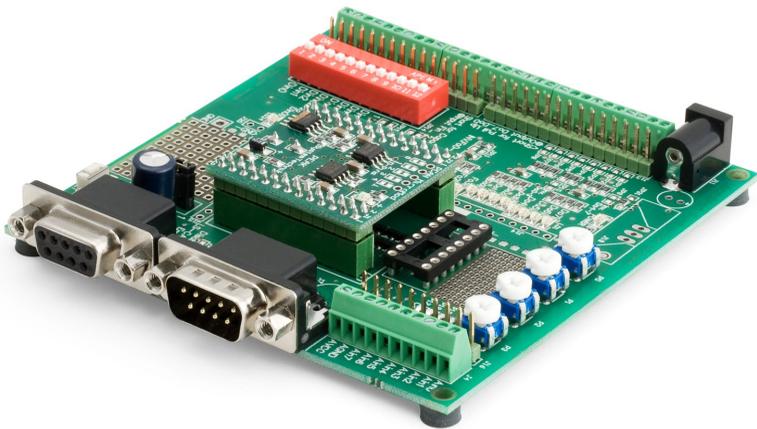
PEAK
System

Relevant products

Product Name	Part number	Model
PCAN-MicroMod Evaluation Board	IPEH-002082	Evaluation Board Rev. 1.3
PCAN-MicroMod Evaluation Kit 1 (PCAN-Dongle)	IPEH-002081	
PCAN-MicroMod Evaluation Kit 2 (PCAN-USB)	IPEH-002079	

The cover picture shows the MicroMod Evaluation Board with plugged on PCAN-MicroMod.

Contents

1 Introduction

The PCAN-MicroMod Evaluation Board facilitates the entry into work with the PCAN-MicroMod and into development of own motherboards for the module. With a diversity of LEDs, switches, and potentiometers the performance of a MicroMod configuration can easily be tested. All inputs and outputs are accessible via pickoffs and screw terminals. Via the serial RS-232 interface firmware to be tested is transferred to the MicroMod.

A kit helps establishing the CAN communication between a PC and the MicroMod, either for transferring a new configuration, or for monitoring and influencing the CAN traffic.

Note: This user manual only refers to the Evaluation Board and its application within the scope of the kits. Separate manuals exist for the PCAN-MicroMod and for the CAN interfaces PCAN-Dongle and PCAN-USB.

1.1 Properties at a Glance

— Pickoffs and screw terminals for inputs and outputs

— Open collector drivers for the digital and the CMOS PWM outputs

— Protected digital inputs

— Low-pass for digital inputs

— LEDs for digital inputs and outputs

— Switches for status modification of the digital inputs

— Potentiometers for analog inputs

— Voltage divider for voltages > 5 V

⌐ Serial RS-232 connector for firmware upload from a PC

⌐ Optional insertion of a Low-speed CAN transceiver alternatively to the High-speed CAN transceiver on the MicroMod

1.2 Scope of Supply

⌐ PCAN-MicroMod Evaluation Board

⌐ AC adaptor

⌐ Configuration software for Windows 10, 8.1, 7 (32/64-bit)

⌐ Manual and circuit diagram of the Evaluation Board in PDF format

Additionally with Kit 1/Kit 2 (IPEH-002081/79)

⌐ PCAN-MicroMod

⌐ 2 m CAN cable with termination on both ends (each 120 Ω) for High-speed CAN

⌐ CAN interface PCAN-Dongle PS/2 (Kit 1)

⌐ CAN interface PCAN-USB (Kit 2)

2 Setting Up the Evaluation Kit for Operation

This chapter gives a quick overview of the needed steps for the straightforward startup of the Evaluation Kit.

▶ Do the following for the setup:

1. Only PCAN-Dongle: Connect the PCAN-Dongle to the switched off PC. Start the PC.

2. On the PC under Windows, install the device driver for either the PCAN-Dongle or the PCAN-USB adapter from the supplied CD.

3. Only PCAN-USB: Connect the PCAN-USB adapter to the PC.

4. Connect the PCAN-Dongle or the PCAN-USB adapter and the Evaluation Board using the CAN cable.

5. Connect the AC adaptor to the Evaluation Board in order to supply it.

6. Under Windows, install the configuration program PCAN-MicroMod Configuration from the supplied CD (Tools section).

7. Start PCAN-MicroMod Configuration, create a configuration, and finally send this configuration to the MicroMod (see program help).

8. You can now work with signals at the I/O ports as defined in the configuration. Please consider the explanations in the following chapter. For monitoring and transmitting CAN messages on the PC side, you can use the simple CAN monitoring software PCAN-View.

3 Components of the Evaluation Board

This chapter describes the function units and connectors of the Eva-luation Board. For details you can also refer to the circuit diagram in Appendix A on page 31.

3.1 Power Supply

The Evaluation Board is supplied by the included AC adaptor with 9 V DC (connector J11, upper left). When using an alternative vol-tage supply, the input voltage can be in the range of 6.4 to 12 V. The voltage regulator on the board provides the necessary supply for the MicroMod (JP31 shortened on position 1-2, delivery status).

Figure 1: Polarity of the supply socket

The **LED** LD25 indicates that the Evaluation Board is supplied.

At higher input voltages and concurrent higher environment tempe-ratures (e.g. 12 V, above room temperature) an **alternative voltage regulator** 7805 with heat sink can be inserted on position J19. Optionally the use of an **integrated switch regulator** (e.g. PT5101, PT78HT205, PT78ST105, each by Texas Instruments) is possible. For example, this is reasonable in an environment with higher input voltage (e.g. 24 V). In all cases each JP30 and JP31 must be shor-tened in position 2-3 (positions 1-2 stay open).

3.2 CAN Connector

The 9-pin D-Sub male connector J17 is used for CAN connection, positioned on the mid right of the Evaluation Board. The pin assignment of the CAN connector corresponds to the specification CiA® 303-1.
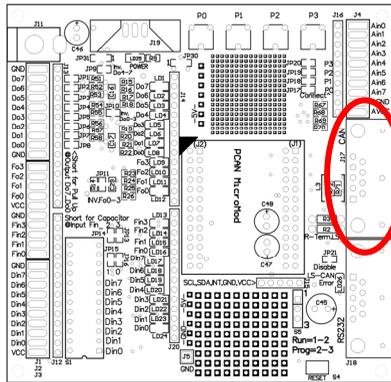
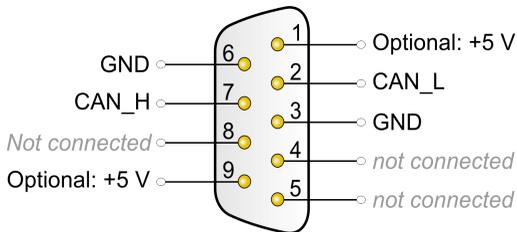Figure 2: Position of the CAN connector

Figure 3: Assignment of the D-Sub male connector for CAN

3.2.1 Connector Shield

With solder jumpers on the positions JP22 and JP25 on the bottom side of the Evaluation Board the ground can be connected to the connector shield.

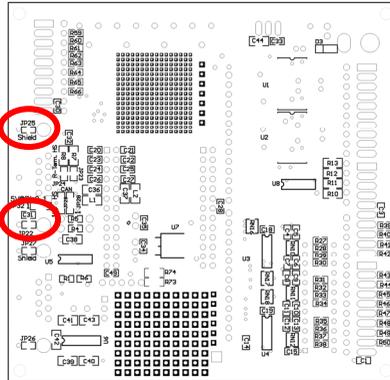Figure 4: Positions JP22 and JP25 on the bottom side of the Evaluation Board

3.2.2 High-speed CAN Bus Termination

If the Evaluation Board is connected to one end of the High-speed CAN bus and the CAN bus is not terminated at that end, a termination can be activated on the Evaluation Board. To do so, solder jumpers are set on positions JP23 and JP24 (delivery status: open = no termination).
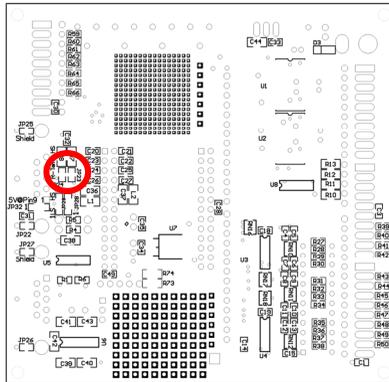
Figure 5: Positions JP23 and JP24 on the bottom side of the Evaluation Board

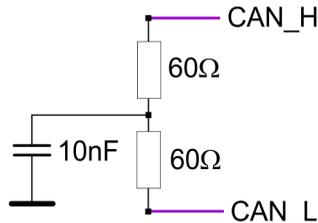For better electromagnetic compatibility a split termination is implemented.

Figure 6: Split termination for the High-speed CAN bus

3.2.3   5-Volt Supply for External Devices

With solder jumpers on position JP32 a 5-Volt supply can be routed to pin 1, pin 9, or to both pins (delivery status: open = no supply). Thus devices with low power consumption (e.g. a bus converter) can be directly supplied via the CAN connector.
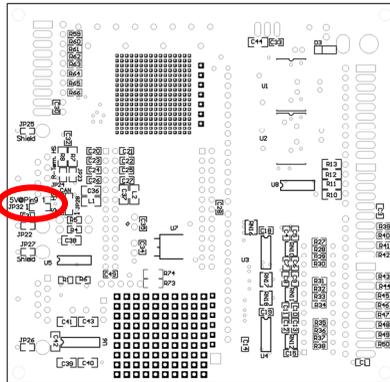
Figure 7: Position JP32 on the bottom side of the Evaluation Board

5-Volt supply →	None	Pin 1	Pin 9	Pin 1 + Pin 9
Solder jumper(s) on JP32	none	2-3	1-2	1-2-3

3.2.4   Low-speed CAN (ISO 11898-3)

A Low-speed CAN transceiver TJA1054 can be equipped on position U5 of the Evaluation Board. The following measures are additionally necessary for Low-speed CAN operation:

- On the MicroMod, the 0-Ohm resistor below and right to the label "4" must be unsoldered in order to disconnect the High-speed CAN transceiver from the CAN controller.
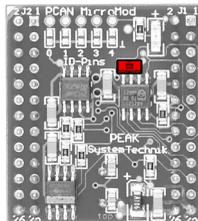
Figure 8: Position of the 0-Ohm resistor on the MicroMod

▢ The solder jumpers on the positions JP28 and JP29 must be shifted from HS (High-speed) to LS (Low-speed).

Figure 9: Positions JP28 and JP29 on the bottom side of the Evaluation Board

▢ The lines CAN_L and CAN_H are terminated with 5.6 kΩ each. For a termination with lower resistance the resistors R2 and R3 can be equipped in addition. They are in parallel with the existing termination resistors.
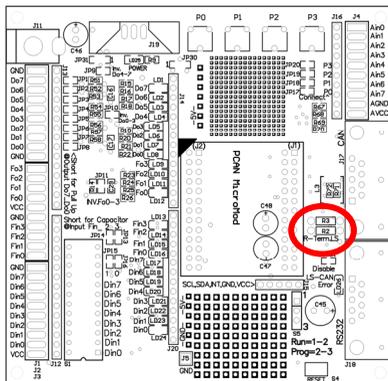
Figure 10: Positions R2 and R3

The **error condition** of the Low-speed CAN transceiver is indicated by the LED LD26.
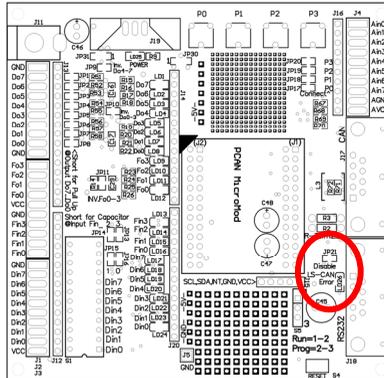
Figure 11: Position of the error status LED for Low-speed CAN, and position JP21
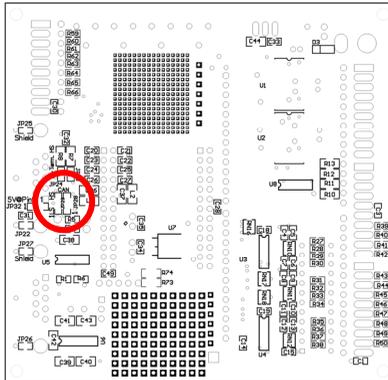
For again operating with High-speed CAN, the equipped Low-speed CAN transceiver can be **deactivated** by setting a solder jumper on position JP21. Furthermore, the first two measures must be undone. On the MicroMod a solder jumper instead of the 0-Ohm resistor is sufficient.

3.3   MicroMod Position

When you mount the MicroMod, take notice of the white triangular marks on each the Evaluation Board and the MicroMod (upper left corner). These marks must align.
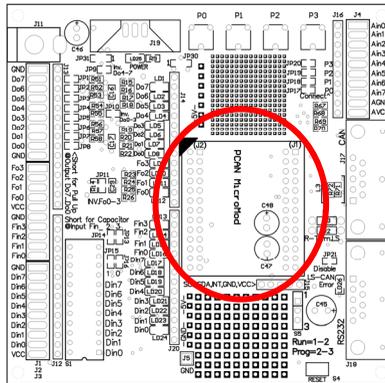
Figure 12: MicroMod position
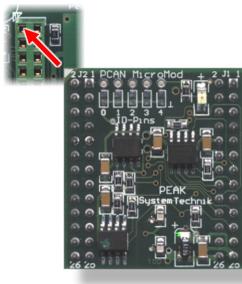
Figure 13: Positioning marks on the MicroMod
and the Evaluation Board

Another help may be the orientation of the labeling. With mounted MicroMod the labels have the same orientation on both PCBs (not upside down).

3.4 Digital Inputs

The Evaluation Board has 8 digital inputs with TTL levels. The corresponding connector is J3 (screw terminals on the lower left).


Figure 14: Area of the digital inputs
with the associated DIP switches and LEDs

Each input has a pull-up resistor (10 kΩ) and is Low-active, so the inputs are switched against GND. Each input status is indicated by an LED. For test purposes the input signal can be switched with the dip switch S1. The corresponding switches are labeled "Din0" to "Din7". The inputs have a low-pass filter with 100 kΩ/4,7 nF.

Signals leading directly to the **MicroMod** can be picked off at the measuring points on strip J20, positions 6 to 13 (position 1 is the upper one).

3.5 Frequency Inputs

The Evaluation Board has 4 frequency inputs. The corresponding connector is J2 (Fin0 to Fin3, screw terminals on the mid left).
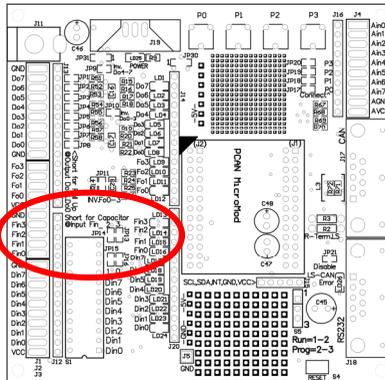

Figure 15: Area of the frequency inputs
with the associated DIP switches, LEDs, and the solder positions for adjustments

The MicroMod can meter frequencies from 1 Hz to 10 kHz.

To activate a **low-pass** for the input path, a capacitor with 4.7 nF can be engaged behind the existing series resistance of 100 kΩ by using solderbridges for positions JP13 to JP16.

Frequency input	Solder jumpers for low-pass on position
Fin0	JP16
Fin1	JP15
Fin2	JP14
Fin3	JP13

3.6   Digital Outputs

The Evaluation Board has 8 digital outputs. The corresponding connector is J1 (screw terminals on the upper left).
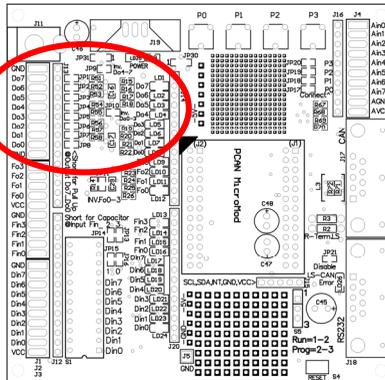

Figure 16: Area of the digital outputs
with the associated LEDs and the solder positions for adjustments

The outputs are Low-side switches with a maximum load of 350 mA. The LEDs LD1 to LD8 indicate each status of the outputs. If an LED is on, the output is active and is switched against ground.

With solder jumpers on positions JP1 to JP8 a **pull-up resistor** (3.3 kΩ) can be engaged for each output (delivery status: open = Low-side switch).

With a solder jumpers on position JP10 the outputs 0 to 3 and on position JP9 the outputs 4 to 7 can be **inverted** by hardware (delivery status: open = not inverted).

3.7   Frequency/PWM Outputs

The MicroMod can generate frequency signals and PWM signals. The corresponding connector is J2 (Fo0 to Fo3, screw terminal on the mid left).
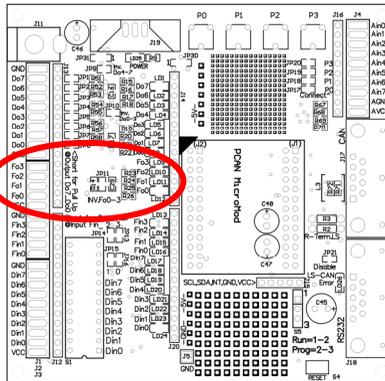

Figure 17: Area of the frequency/PWM outputs
with the associated LEDs and the solder positions for adjustments

The output signal is protected against short circuit with a series resistance of 82 Ω.

With a solder jumper on position JP11 the output signal can be **inverted** by hardware (delivery status: open = not inverted).

3.8 Analog Inputs

The Evaluation Board has 8 analog inputs. The corresponding connector is J4 (screw terminals on the upper right).
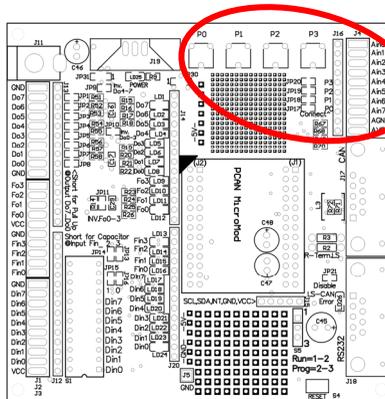

Figure 18: Area of the analog inputs
with the associated potentiometers and the solder positions for adjustments

The analog reference voltage is 5 V. The input impedance is 6.5 kΩ (3.2 kΩ analog input microcontroller, 3.3 kΩ series impedance in front of the microcontroller input).

The Evaluation Board has 4 **potentiometers** (P0 to P3) which can be used for simulating input signals. With solder jumpers on positions JP17 to JP20 the potentiometers are connected to Ain0 to Ain3 (delivery status: closed = connected).

For **external sensors** the screw terminals provide the supply positions AGND and AVCC.

3.9   Serial Bus (SCL, SDA, INT)

The ports SCL, SDA, and INT on the strip J15 do not have a function with the standard firmware for the MicroMod. In connection with an alternative firmware, they can be used for a serial bus (e.g. I^2C or SPI).
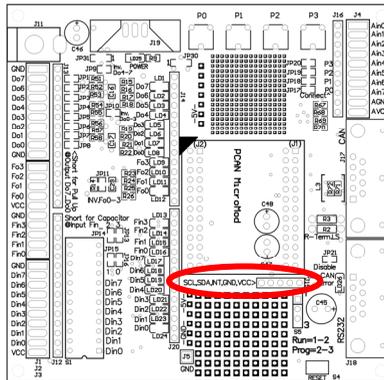
Figure 19: Position of strip J15

J15	Pin MicroMod	Function
SCL	J1:19	Serial Clock
SDA	J1:20	Serial Data (I^2C) / Serial Data Out (SPI)
INT	J1:22	Serial Data In (SPI)
GND		Ground
VCC		Supply voltage 5 V DC

3.10 Prototyping Areas

The Evaluation Board has prototyping areas with 50-mil and 100-mil grids. Small circuits can be added here to the inputs and outputs. At the sides of the prototyping areas are some additional soldering points of the 5-Volt supply.
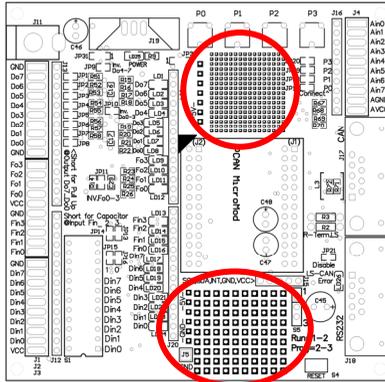

Figure 20: Positions of the prototyping areas

3.11 RS-232 Connector

The Evaluation Board has an RS-232 connector (9-pin D-Sub female), positioned on the lower right of the Evaluation Board. This connector is used for uploading a firmware to the MicroMod. The upload procedure is described in the following chapter.
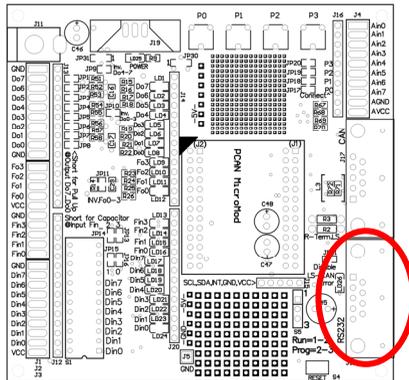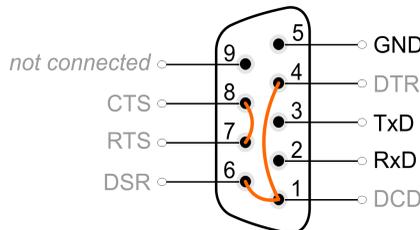

Figure 21: Position of the RS-232 connector

Figure 22: Assignment of the D-Sub socket for RS-232

For communication the use of the data lines (RxD, TxD) and ground is sufficient. The control lines for the RS-232 communication are internally connected at the connector as shown in the figure. The Evaluation Board does not provide functions for these lines.

3.11.1   Connector Shield

With solder jumpers on the positions JP26 and JP27 on the bottom side of the Evaluation Board the ground can be connected to the connector shield.

Figure 23: Positions JP26 and JP27 on the bottom side of the Evaluation Board

4 Uploading Firmware to the MicroMod

For a firmware upload you need:

— a serial RS-232 port on a computer running Windows

— a serial 1:1 cable with male D-Sub connectors

— the Windows software FUJITSU FLASH MCU Programmer. You can download a setup program of the current version from the following web page: mcu.emea.fujitsu.com/mcu_tool/detail/FLASH_PROGRAMMER_16LX.htm

— the firmware file (`*.mhx`)

▶ Do the following to upload a new firmware:

1. Make sure that the Evaluation Board with the MicroMod is switched off.

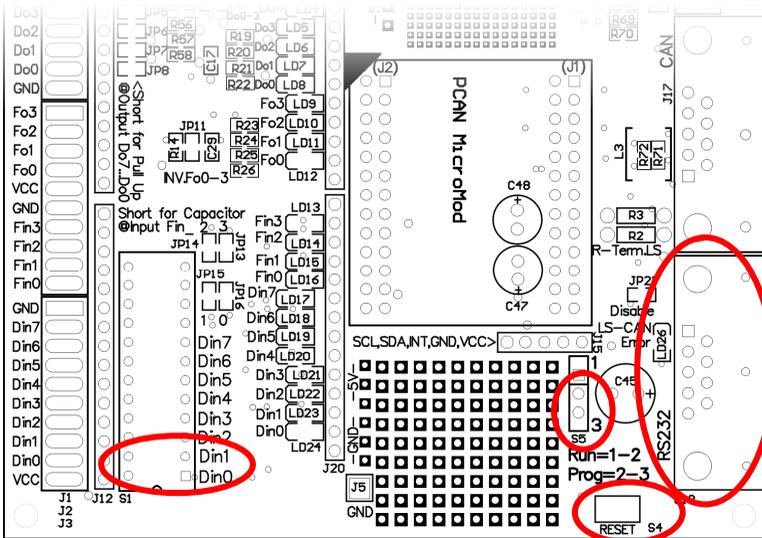2. Connect the Evaluation Board and the serial port of you computer with the serial cable.

Figure 24: The marked elements on the Evaluation Board
are used in this and in the following steps.

3. Set the jumper S5 to position 2-3 so that the MicroMod will start in programming mode.

4. Apply power.

   The LED on the MicroMod stays off.

5. Ensure that the switches for the digital inputs Din0 and Din1 are set to Off (right switch position).

6. Reset the MicroMod with the push button S4.

7.   Under Windows, start the FUJITSU FLASH MCU Programmer (FMC16LX).
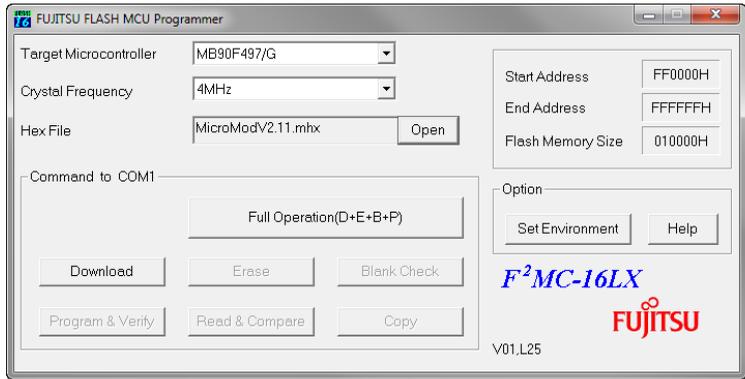
8.   Select **Set Environment** in order to check that the indicated serial port is corresponding to the actually used one. Confirm with **OK**.

9.   Do the following settings:

     Target Microcontroller: MB90F497/G

     Crystal Frequency: 4 MHz

10. Use the **Open** button behind the **Hex File** field to select the firmware file that shall be used for upload.

11. Start the transfer sequence by clicking on **Full Operation (D+E+B+P+R)**.

     The process takes approximately one minute. At its end a message is shown that confirms the proper sequence.
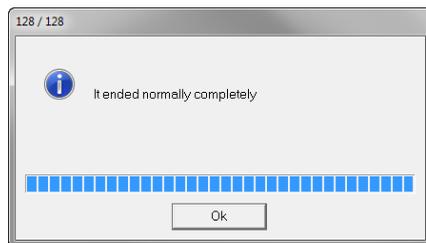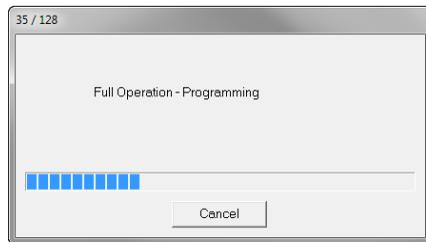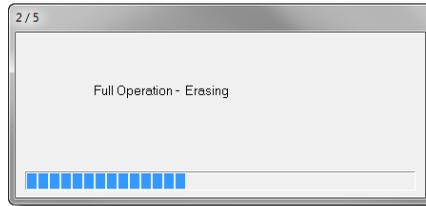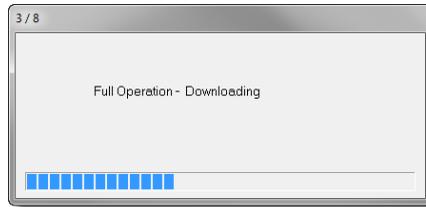
12. Disconnect the power from the Evaluation Board.

13. Setup the normal operation mode (Run mode) for the MicroMod (jumper S5 to 1-2), before applying power again.

The upload procedure is finished and you can use the Evaluation Board with the MicroMod normally now.

LED-Status After Updating the Standard Firmware

If after an update the LED on the MicroMod is **blinking fast** (2 Hz) in normal operation mode, the current configuration is not compatible to the new firmware version. In this case, transfer the configuration to the MicroMod again, with adaptation if needed.

If the LED stays **off** after the update, the firmware does not work. Repeat the upload procedure in this case or use another version of the standard firmware.

5 Technical Specifications

Power supply	
Supply voltage	6.4 – 12 V DC (with existing voltage regulator), for higher input voltages the use of an alternative voltage regulator or an integrated switch regulator is possible

Digital inputs	
Count	8
Level	TTL, Low-active
Low-pass	100 kΩ/4.7 nF
Additional circuits	DIP switches

Frequency inputs	
Count	4
Level	TTL
Low-pass	100 kΩ/4.7 nF, enabled with solder jumpers JP13 - JP16 (delivery status: disabled)

Analog inputs	
Count	8
Input voltage	0 - 5 V
Resolution	10 bits
Sampling rate	1 kHz
Input impedance	6.5 kΩ (3.3 kΩ Evaluation Board + 3.2 kΩ MicroMod)
Additional circuits	Potentiometers connectible for inputs Ain0 to Ain3

Digital outputs	
Count	8
Type	Low-side switch, pull-up resistors 3.3 kΩ connectible
Load	max. 350 mA

Frequency/PWM outputs

Count	4
Maximum frequency	10 kHz (details: see user manual for the PCAN-MicroMod)

CAN

Transmission standards	High-speed CAN ISO 11898-2 (Transceiver on MicroMod) Transceiver for Low-speed CAN ISO 11898-3 can be inserted on Evaluation Board
Termination	120 Ω for High-speed CAN, connectible with solder jumpers JP23/24 (delivery status: not connected), implemented as split termination (2 x 60 Ω and 10 nF against ground) 5.6 kΩ for Low-speed CAN, lower termination resistance can be inserted
Connection	D-Sub 9-pin m, assignment according to specification CiA® 303-1

Measures

Size of circuit board	100 x 102 mm (W x L)
Weight	88 g (without MicroMod)

Environment

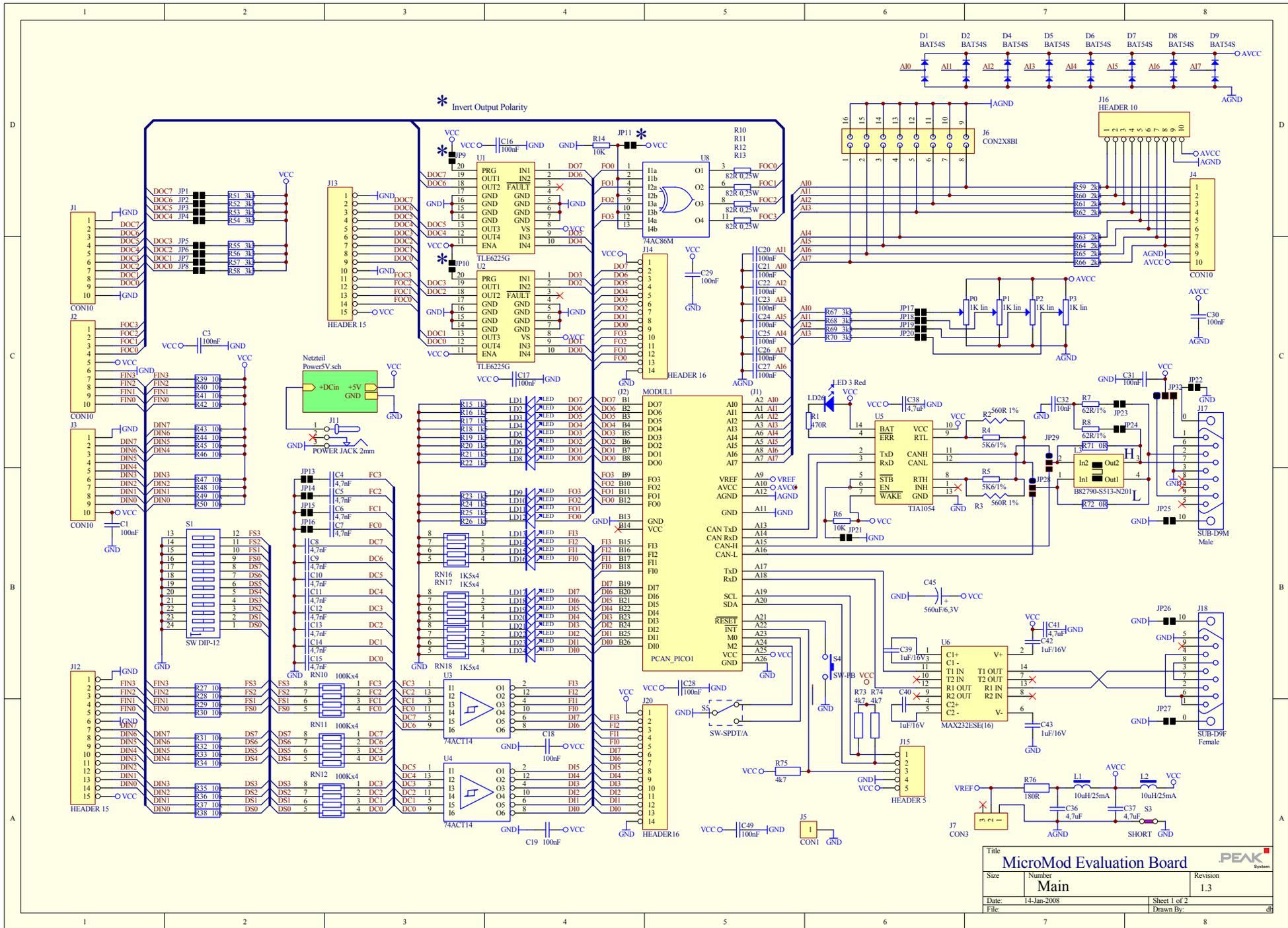|	
Operating temperature	0 - +85 °C (+32 - +185 °F)
Temperature for storage and transport	-40 - +100 °C (-40 - +212 °F)
Relative humidity	15% - 90%, not condensing

Conformity

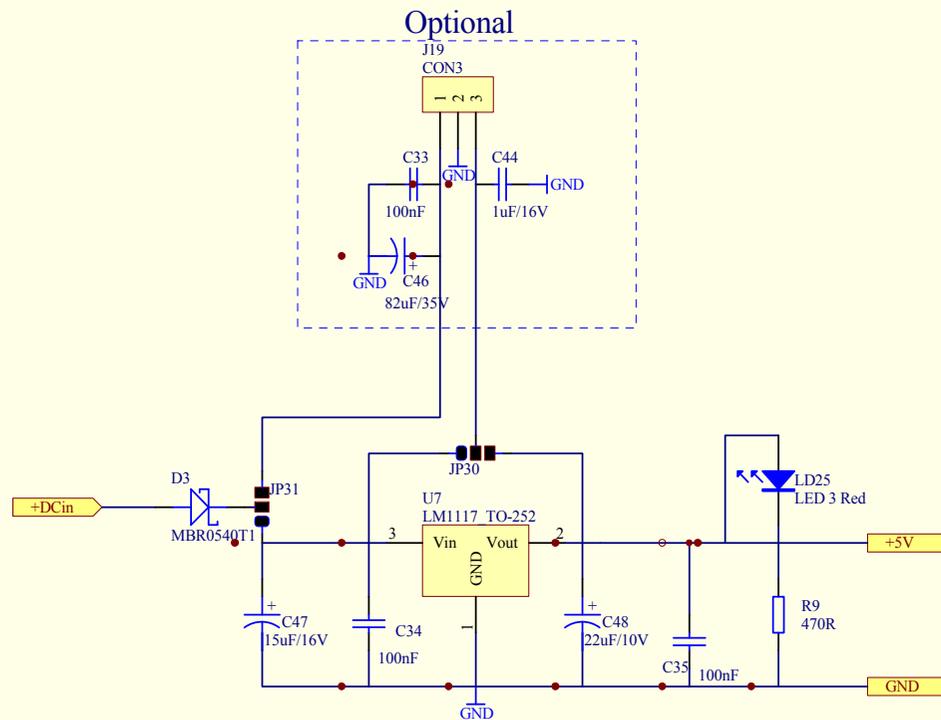|	
RoHS 2	Directive 2011/65/EU DIN EN 50581 VDE 0042-12:2013-02

Appendix A Circuit Diagram of the Evaluation Board

See following pages:

- MicroMod Evaluation Board – Main, Sheet 1 of 2
- MicroMod Evaluation Board – Power, Sheet 2 of 2

Title: MicroMod Evaluation Board

Number: Main

Revision: 1.3

Date: 14-Jan-2008

Sheet 1 of 2

.PEAK System

Optional

J19
CON3
1 2 3

C33
100nF

GND

C44
1uF/16V

GND

GND
C46
82uF/35V

D3
MBR0540T1

JP31

JP30

U7
LM1117_TO-252
Vin   Vout
GND
3   2
1

LD25
LED 3 Red

+DCin

+5V

R9
470R

C47
15uF/16V

C34
100nF

C48
22uF/10V

C35 100nF

GND

GND

GND