

# iC-MHM EVAL MHM1D

## EVALUATION BOARD DESCRIPTION

### ORDERING INFORMATION

Type	Order Designation	Description
Evaluation board	iC-MHM EVAL MHM1D	iC-MHM evaluation board Ready-to-operate, includes adapter MHM3M, accessible by GUI using PC adapter (not included).
Adapter MHM3M	iC-MHM iCSY MHM3M	QFN28 adapter board with iC-MHM
Evaluation software	iC-MHM GUI	GUI software for Windows PC Device setup file generation, board configuration via adapter.
<b>Related Parts</b>	(to be ordered separately)	
PC adapter	iC-MB3 iCSY MB3U-I2C iC-MB4 iCSY MB4U iC-MB5 iCSY MB5U	PC-USB adapter for BiSS/SSI w. I2C/SPI extension cable High performance BiSS C to PC adapter (USB) High performance isolated BiSS C to PC adapter (USB)

### BOARD MHM1D

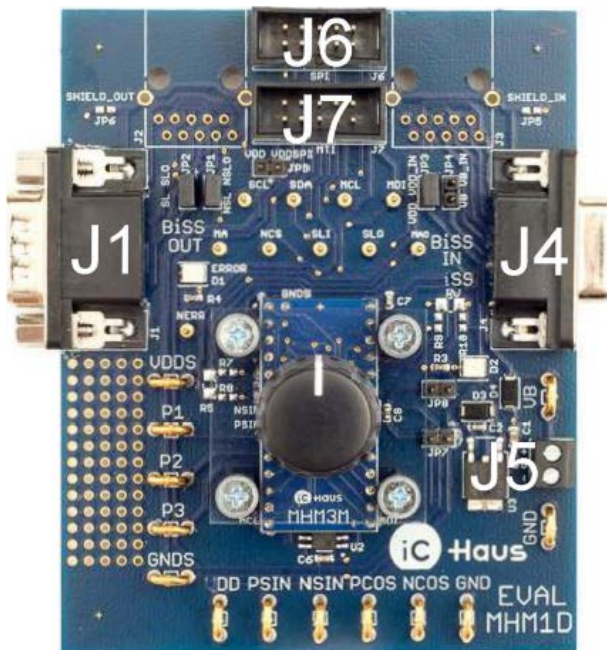


Figure 1: Board MHM1D (top view);  
size approx. 80 mm x 100 mm

PLUG	CONFIGURATION
J1	BiSS Interface Output (daisy chain) (D-sub 9-pin, male) Do not close JP1 and JP2 if using J1.
J4	BiSS Interface Input (to BiSS master) (D-sub 9-pole, female) Close JP1 and JP2 if using J1. Close JP3 to power board by J4 (5V).
J5	Screw Terminal for Power Supply VB (8 V to 20 V) Open JP4 and JP3.
J6	SPI Interface (iC-MHM) (10-pin, male connector)
J7	Multiturn Interface (to iC-PV, iC-MV) (10-pin, male connector)
LED	FUNCTION
LED D1	Indicator for Error Message (red)
LED D2	Indicator for Power Supply (green)

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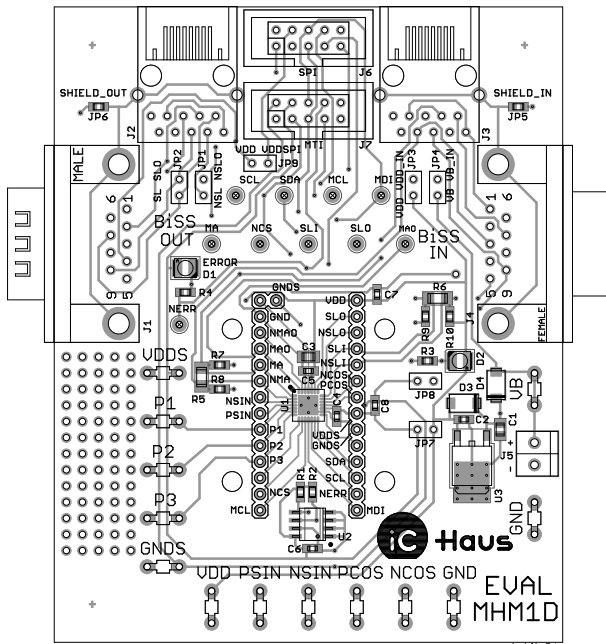


Figure 2: Component side

### TERMINAL DESCRIPTION

VB	+8 to +20 V Board Supply Input *
GND	Ground
VDD	+5 V IC Supply Voltage **
PSIN	Analog Sine Output
NSIN	Analog Sine Output (inverted)
PCOS	Analog Cosine Output
NCOS	Analog Cosine Output (inverted)
GND	Ground
VDDS	Switched Supply Output (20 mA max.)
P1	Digital I/O Port 1
P2	Digital I/O Port 2
P3	Digital I/O Port 3
GNDS	Switched GND Link (20 mA max.)
NERR	Error Message I/O (low active)
MA	BiSS / SSI Clock Input
NCS	SPI Clock Input (SCLK)
	SPI Enable and Chip Select
	Input (low active)
SLI	BiSS Data Input
	SPI Data Input (MOSI)
SLO	BiSS / SSI Data Output
	SPI Data Output (MISO)
MAO	BiSS Clock Output
SCL	I <sup>2</sup> C Clock Line
SDA	I <sup>2</sup> C Data Line
MCL	Multiturn SSI Clock Output
MDI	Multiturn SSI Data Input

#### Notes:

\*) External supply is optional. If supplying VB, remove jumpers JP3 and JP4.

\*\*) External supply is optional. If supplying VDD, remove jumpers JP3 and JP4.

\*) and \*\*) The board takes approx. 70 mA if a BiSS adapter connects J4, otherwise approx. 35 mA.

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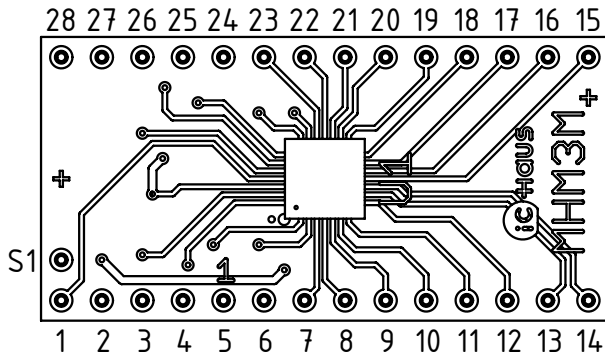


Figure 3: Adapter MHM3M

MHM3M	iC-MHM	Name
1	25	n.c.
2	26	GND
3	27	NMAO
4	28	MAO
5	1	MA
6	2	NMA
7	3	NSIN
8	4	PSIN
9	5	P1
10	6	P2
11	7	P3
12	8	n.c.
13	9	NCS
14	10	MCL
15	11	MDI
16	12	NERR
17	13	SCL
18	14	SDA
19	15	n.c.
20	16	GNDS
21	17	VDDS
22	18	PCOS
23	19	NCOS
24	20	NSLI
25	21	SLI
26	22	NSLO
27	23	SLO
28	24	VDD
S1		GNDS
S2, S3, S4		n.c.

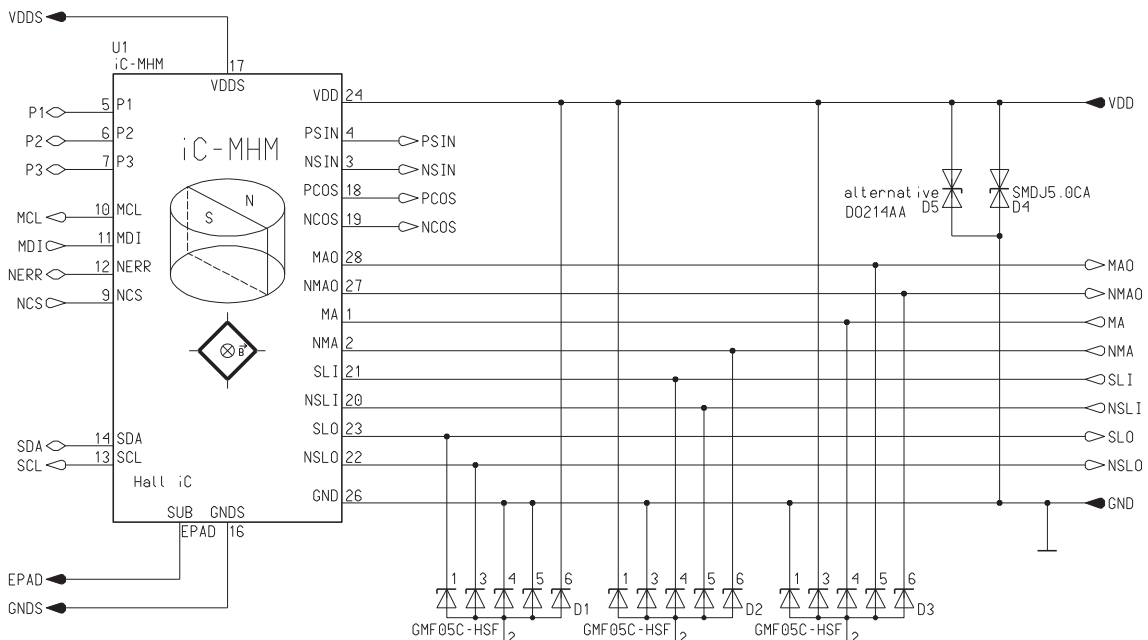


Figure 4: Circuit diagram of adapter MHM3M

# iC-MHM EVAL MHM1D

## EVALUATION BOARD DESCRIPTION



Rev B2, Page 4/10

### RELATED PRODUCTS AND DOCUMENTS

- IC Documentation
  - [http://www.ichaus.de/MHM\\_datasheet](http://www.ichaus.de/MHM_datasheet)
  - [http://www.ichaus.de/MHM3M\\_packdata](http://www.ichaus.de/MHM3M_packdata)
- PC-USB Adapter Description
  - <http://www.ichaus.de/MB3U-I2C>
  - <http://www.ichaus.de/MB4U>
  - <http://www.ichaus.de/MB5U>
- GUI Software for Windows PC
  - <http://www.ichaus.de/iC-MHM>

### PINOUT OF CONNECTORS AND TERMINALS

#### BiSS OUT

D-sub 9-pin connector J1 - male

PIN	Name	Function
1	VB	+12 V Supply Voltage
2	MAO +	Master Clock Output
3	MAO -	Master Clock Output (inverted)
4	VDD	+5 V Supply Voltage
5	SLO -	Slave Data Output (inverted)
6	GND	0 V Ground
7	SL +	Slave Data
8	SL -	Slave Data (inverted)
9	SLO +	Slave Data Output

#### BiSS IN

D-sub 9-pole connector J4 - female

PIN	Name	Function
1	VB	+12 V Supply Voltage
2	MA +	Master Clock Input
3	MA -	Master Clock Input (inverted)
4	VDD	+5 V Supply Voltage
5	SLI -	Slave Data Input (inverted)
6	GND	0 V Ground
7	SL +	Slave Data
8	SL -	Slave Data (inverted)
9	SLI +	Slave Data Input

#### SPI Interface

10-pin connector J6

PIN	Name	Function
1	MA (SCLK)	BiSS / SSI Clock Input SPI Clock Input
2	GND	Ground (line in)
3	n.c.	not connected
4	VDD	+5 V Supply Voltage (line in)
5	MCL	Multiturn SSI Clock Output
6	MDI	Multiturn SSI Data Input
7	SLI (MOSI)	BiSS Data Input SPI Data Input
8	NCS	SPI Enable and Chip Select Input (low active)
9	SLO (MISO)	BiSS / SSI Data Output SPI Data Output
10	GND	Ground (line in)

#### Multiturn Interface (MTI)

10-pin connector J7

PIN	Name	Function
1	SCL	I <sup>2</sup> C Clock Line
2	GNDS	Switched GND (polarity protected)
3	SCL	I <sup>2</sup> C Clock Line
4	VDDS	Switched VDD (polarity protected)
5	MCL	Multiturn SSI Clock Output
6	MDI	Multiturn SSI Data Input
7	SDA	I <sup>2</sup> C Data Line
8	NERR	Error Mes. Input / Output (low active)
9	SDA	I <sup>2</sup> C Data Line
10	GNDS	Switched GND (polarity protected)

# iC-MHM EVAL MHM1D

## EVALUATION BOARD DESCRIPTION

### DESCRIPTION OF JUMPERS

The default settings of the jumpers (shipping configuration) are shown in Figure 1.

Jumper JP1	Function
Closed (default)	Bridges SLO- / SL- (BiSS bus termination).
Open	SLO- / SL- available on BiSS OUT (J1) for next BiSS device.

Jumper JP2	Function
Closed (default)	Bridges SLO+ / SL+ (BiSS bus termination).
Open	SLO+ / SL+ available on BiSS OUT (J1) for next BiSS device.

Jumper JP3	Function
Closed (default)	VDD sourced from PC adapter.
Open	External supply required. Connect +5 V to VDD terminal.

Jumper JP4	Function
Closed	VB_IN of J4 connected to VB to generate VDD.
Open (default)	External supply required. Connect +8 to +20 V to VB terminal or +5 V to VDD (open JP3).

Jumper JP7	Function
Closed (default)	Bridges VDDS to VDD. Connect a diode for reverse polarity protection.
Open	VDDS is switched by iC-MHM.

Jumper JP8	Function
Closed (default)	Bridges GNDS to GND.
Open	GNDS is switched by iC-MHM.

Jumper JP9	Function
Closed	Board supplied by conn. J6.
Open (default)	VDD for SPI is not connected.

# iC-MHM EVAL MHM1D

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### CIRCUIT SCHEMATIC

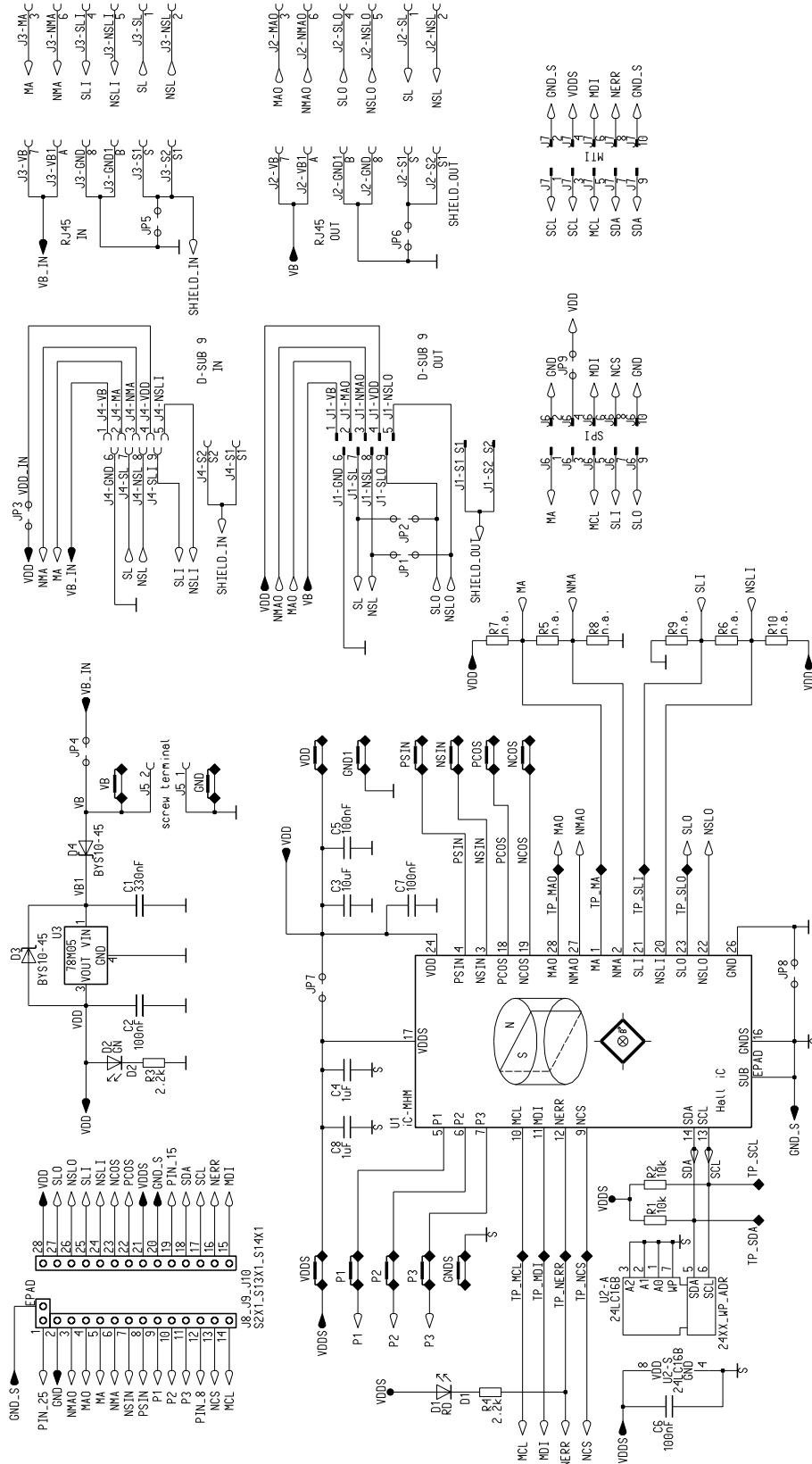


Figure 5: Circuit diagram including optional components.

# iC-MHM EVAL MHM1D

## EVALUATION BOARD DESCRIPTION



Rev B2, Page 7/10

### ASSEMBLY PART LIST

Component	Typical Value	Comment
Board		MHM1D
C1	330 nF	Bypass capacitor
C2, C5, C6, C7	100 nF	Bypass capacitor
C3	10 $\mu$ F	Bypass capacitor
C4, C8	1 $\mu$ F	Bypass capacitor
J1	D-SUB 9 M	BiSS interface connector
J2, J3	RJ45 connector	BiSS interface connector (not assembled)
J4	D-SUB 9 F	BiSS interface connector
J5	AKL059-2	Screwing terminal for power supply VB
J6, J7	WSL10G	Connectors WSL 10-pin, male
JP1, JP2, JP3, JP4, JP7, JP8, JP9	SL LP1/097 2G	Jumper
JP5, JP6		Solder bridge
D1	LS-T67K	Indicator LED (red) for error message
D2	LG-T67K	Indicator LED (green) for power supply
D3, D4	BYS10-45	Reverse protection diodes
R1, R2	10 k $\Omega$	I <sup>2</sup> C Pull-up (optional)
R3, R4	2.2 k $\Omega$	LED series resistors
R5, R6	100 $\Omega$	Line termination resistors, optional (not assembled)
R7, R8, R9, R10	0 $\Omega$	Line series resistors (not assembled)
U1	Socket	For adapter MHM3M
U2	24LC16B	I <sup>2</sup> C EEPROM
U3	78M05	Voltage regulator (5 V)



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### APPLICATION EXAMPLE

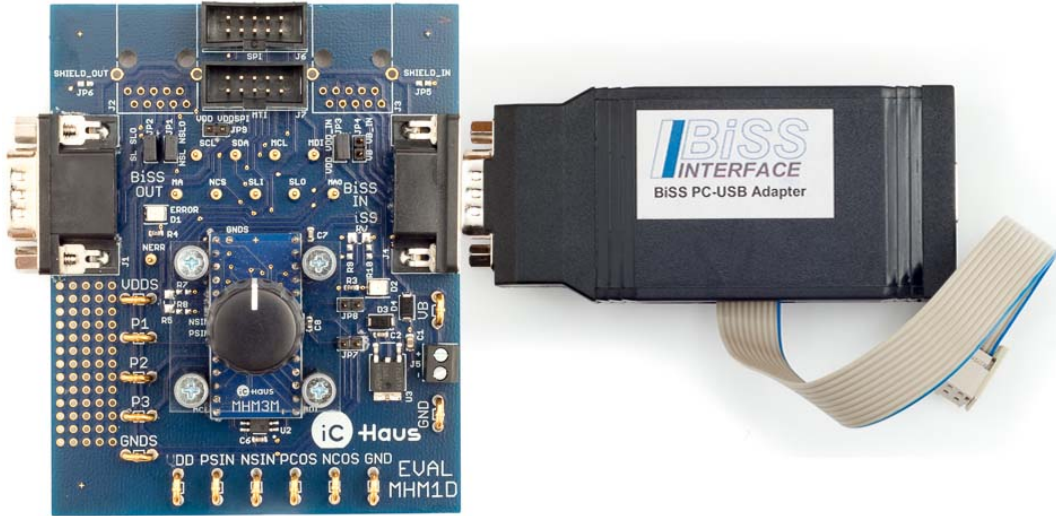


Figure 6: iC-MHM eval board with MB3U-I2C adapter

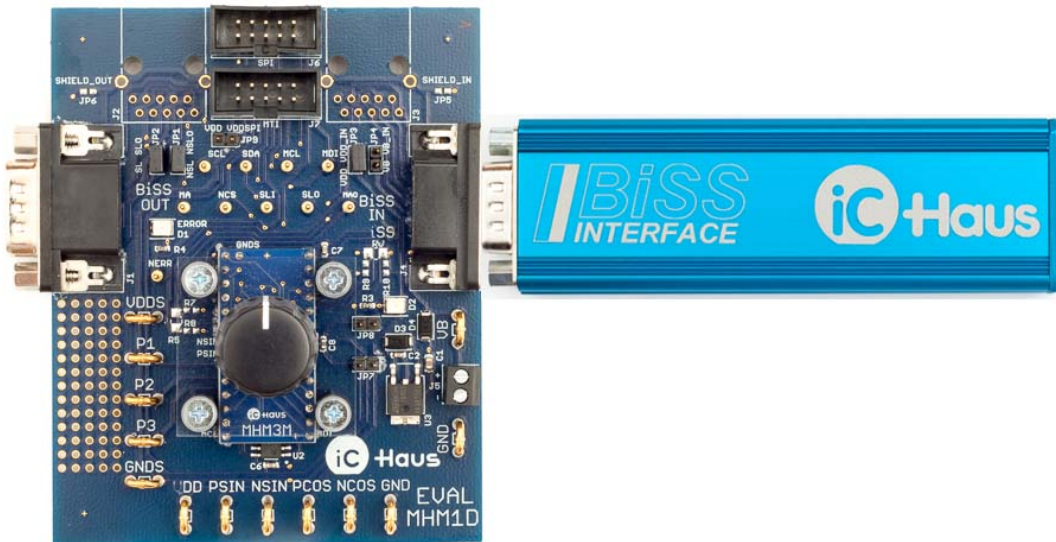


Figure 7: iC-MHM eval board with MB4U adapter



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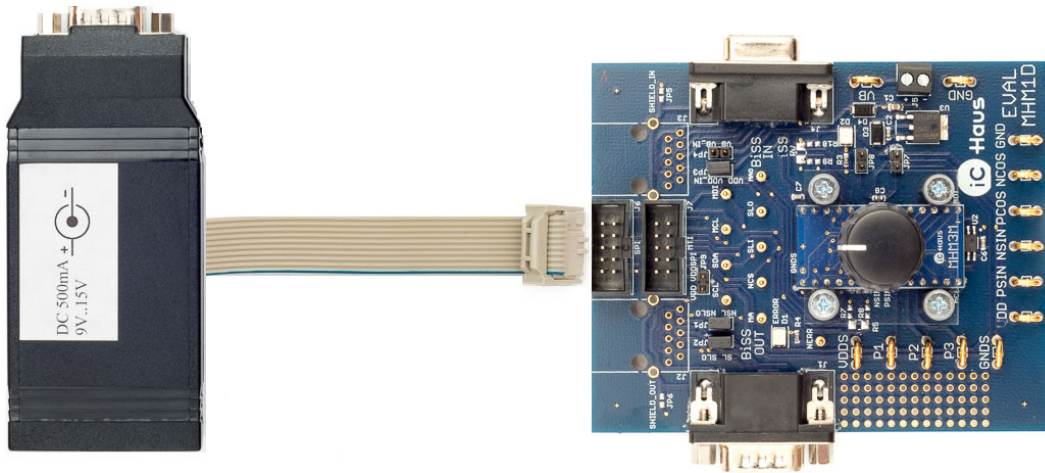


Figure 8: iC-MHM eval board with MB3U-I2C adapter via SPI

### Application Hints

The input voltages must not exceed the chip's supply voltage (5 V).

For **BiSS and SSI interface** use connector J4. Set parameter `RTX_MODE` to `RS422 - RS422` as driver.

For **SPI interface** use connector J6 and set jumper JP9. Set `RTX_MODE` to `TTL - RS422` (default) or `TTL - TTL` as driver.

# iC-MHM EVAL MHM1D

## EVALUATION BOARD DESCRIPTION



Rev B2, Page 10/10

### REVISION HISTORY

Rel.	Rel. Date*	Chapter	Modification	Page
A1	2014-10-21	All	Initial release	

Rel.	Rel. Date*	Chapter	Modification	Page
A2	2015-06-08	BOARD MHM1D	Description of adapter PC145 extended	3
		EVALUATION SOFTWARE	Chapter revised	9 to 12

Rel.	Rel. Date*	Chapter	Modification	Page
A3	2016-10-19	ORDERING INFORMATION, BOARD MHM1D	Order designation and description of adapter MHM3M extended	1, 3
		EVALUATION SOFTWARE	Updated to new software revision	9 to 12

Rel.	Rel. Date*	Chapter	Modification	Page
B1	2019-01-07	BOARD MHM1D	Figure 1 revised and Figure 4 added	1, 3
		DESCRIPTION OF JUMPERS	Jumper JP9: SPI power supply added	5
		CIRCUIT SCHEMATIC	New redesign	6
		APPLICATION EXAMPLE	Figure 6 and 7 revised	8
		EVALUATION SOFTWARE	Updated to new software revision D2	10, 11

Rel.	Rel. Date*	Chapter	Modification	Page
B2	2020-06-17	BOARD MHM1D	Notes on the jumper setting for external supply changed	1, 2
		ASSEMBLY PART LIST	The resistors R1 and R2 are optional	7
		APPLICATION EXAMPLE	Figure 8 and hint for line drivers added	9
		EVALUATION SOFTWARE	Chapter removed	

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