MB5U HIGH PERFORMANCE GALVANICALLY ISOLATED BiSS(SSI)-TO-PC ADAPTER (USB)

FEATURES

- Simple evaluation and implementation of iC-Haus components
- BiSS/SSI Interface (9-pin D-sub connector)
- 5 V sensor supply
- Fast communication:
  10 MHz (BiSS), 4 MHz (SSI)
- Equidistant data acquisition
- Galvanic isolation
- USB 2.0 compatible PC interface
- Field capable design:
  aluminium case, field interfaces, powered via USB

APPLICATIONS

- Application development using iC-Haus components
- Application debugging using iC-Haus components

SYSTEM VIEW

DESCRIPTION

MB5U is a PC USB adapter intended to enable a simple evaluation of iC-Haus' integrated circuits using the corresponding evaluation board and GUI software. The adapter provides differential, galvanically isolated RS422 master interfaces for BiSS and SSI via its 9-pin D-sub connector. It enables equidistant data acquisition and is suitable for sensor calibration. The adapter is compatible to USB 2.0. Drivers for Windows 10 and Linux are provided.

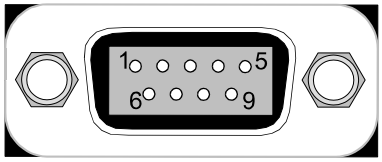
9-Pin D-sub (BiSS/SSI) Connector:

- Differential 5 V RS422 and single-ended BiSS/SSI master interface (enabled by software)
- BiSS C and BiSS B protocol support
- Suitable for up to 8 BiSS slaves
- Maximum bit rate: 10 MBit/s (BiSS), 4 MBit/s (SSI)
- Sensor supply voltage: VDD = 5 V
- Max. load: 200 mA, powered via USB
- Equidistant data acquisition
- Galvanic isolation

Figure 1: iC-MB5 iCSY MB5U

CONNECTORS

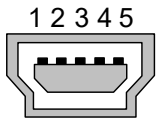
PIN CONFIGURATION
9-pin D-sub (male) for BiSS/SSI



PIN FUNCTIONS

No.	Name	Function
1	n.c.	Not connected
2	MA+	Clock output (positive)
3	MA-	Clock output (negative)
4	VDD	5 V sensor supply voltage output
5	MO-	Master data output (negative) (constant high)
6	GND	Ground (0 V)
7	SL+	Master data input (positive)
8	SL-	Master data input (negative)
9	MO+	Master data output (positive) (constant low)

PIN CONFIGURATION
USB Mini-B



PIN FUNCTIONS

No.	Name	Function
1	Vusb	5 V USB power supply voltage input
2	D-	Data -
3	D+	Data +
4	ID	Identifier: A = GND, B n.c.
5	GND	Ground (0 V)

ABSOLUTE MAXIMUM RATINGS

These ratings do not imply operating conditions; functional operation is not guaranteed. Beyond these ratings device damage may occur.

Item No.	Symbol	Parameter	Conditions	Min.	Max.	Unit
G001	Vusb	USB Power Supply	Depends on USB host supply of adapter and cabling.	4.5	5.5	V
G002	I(Vusb)	Maximum Current Consumption from USB Bus	See USB 2.0 specifications.		500	mA
G003	VG2G	Galvanic Isolation	VG = V(GND_USB) - V(GND_BiSS) Humidity 5% non condensating, 20°C, isolated surface. See TI ISO3086 datasheet		±500	V
G004	PIN7, PIN8	RS422 input pins SL and NSL	See TI ISO3086 datasheet			
G005	Vd()	ESD Susceptibility at all pins	HBM 100 pF discharged through 1.5 kΩ, all pins relative to GNDA		2	kV
G006	Ts	Storage Temperature		0	50	°C

THERMAL DATA

Item No.	Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
T01	Ta	Operating Ambient Temperature Range	Relative humidity: 5%...95% (non condensing)	0		50	°C

All voltages are referenced to ground unless otherwise stated.
All currents flowing into the device pins are positive; all currents flowing out of the device pins are negative.

ELECTRICAL CHARACTERISTICS

Operating conditions: Vusb = 4.5 V...5.5 V, Ta = 0...50 °C, unless otherwise noted.

Item No.	Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
Power Supply Input: Vusb							
001	Vusb	Power Supply Voltage Input	By USB port	4.5	5	5.5	V
002	I(Vusb)	Current Consumption	From USB port			500	mA
Field Power Supply Output: VDD							
101	VDD	Field Power Supply Output Voltage	I(VDD) = 0 mA . . . maximum as specified in El.Char. 102 Rev. 0, Rev. Z, Rev. Y Rev. X	4.5	5.0	5.8 5.5	V V
102	I(VDD)	Field Power Supply Output Current	No RS422 terminator load on MA+ / MA- or MO+ / MO-. VDD = 4.5 V . . . 5.5 V RS422 terminator load on MA+ / MA- or MO+ / MO-. VDD = 4.5 V . . . 5.5 V			200 116	mA mA
9-Pin D-sub (BiSS/SSI) Connector: MA+, MA-, SL+, SL-, MO+, MO-							
201	Vout()	Diff. Voltage Output at MA+, MA-	RL = 54 Ω (according to Texas Instruments™ ISO3086 datasheet)	1.5	2.3	5	V
202	fclk()	Clock Frequency Output at MA+, MA-	50% duty cycle			10	MHz
203	Vt()hi	Input Threshold Voltage hi at SL+ vs. SL-	Io = -8 mA (according to Texas Instruments™ ISO3086 datasheet)			0.2	V
204	Vt()lo	Input Threshold Voltage lo at SL+ vs. SL-	Io = 8 mA (according to Texas Instruments™ ISO3086 datasheet)	-0.2			V
205	Vt()hys	Input Hysteresis	(according to Texas Instruments™ ISO3086 datasheet)		30		mV
206	Rin()	Input Resistance between SL+ and SL-	Line Termination		120		Ω

RELATED PRODUCTS AND DOCUMENTATION

- BiSS Software GUI (with/without LabVIEW™ RTE)
  → www.ichaus.de/biss_gui_rte
  → www.ichaus.de/biss_gui
- BiSS Software DLL
  → https://www.ichaus.de/BiSS_1SL_interface
- IC Configuration Software GUI
  → Please refer to the specific product website at www.ichaus.de
- BiSS Protocol Description
  → www.biss-interface.com/biss_c_en

FUNCTIONAL NOTES

This evaluation kit is intended to be used for development, demonstration and evaluation purposes using iC-Haus products only.

BiSS/ SSI Data Acquisition

BiSS and SSI data frames are triggered by software. Equidistant data acquisition (e.g. for using the Fast Reader window of the BiSS Software GUI or for sensor calibration) is enabled.

BiSS/ SSI Hardware Interface

Most iC-Haus evaluation boards implement a differential 5 V RS422 interface. However, MB5U is also suitable for single-ended BiSS/ SSI applications at pins MA+, SL+, MO+ when configured by software. The availability of this feature depends on the individual software release.

Galvanic Isolation

BiSS signals MA+, MA-, MO+, MO-, SL+ and SL- as well as the supply voltage VDD are galvanically isolated. The MB5U field GND and shielding potential do not need to be identical with the adapter GND and adapter shield.

BiSS Power Supply

The sensor supply voltage VDD = 5 V is enabled/disabled by software. The output voltage VDD and output current I(VDD) of the adapter significantly depend on the used PC, USB port and USB cable. It is recommended to use only the delivered USB cable which provides a high current capability.

Data Clock Frequency

The clock frequency at MA+/MA- (BiSS/ SSI) can be adjusted by software. Table 1 lists the possible frequency range.

FREQ_SCD(4:0)	R/W
Code	Single-cycle data clock frequency (f_{clk})
0x00 ...0x0F	f_{sys} / [2 * (Code + 1)]
0x10	"not permitted"
0x11 ...0x1F	f_{sys} / [20 * (Code - 15)]
Notes	f_{sys} = 20 MHz (internal system clock)

Table 1: Single-cycle data clock frequency at MA+/MA-

Frame Repetition Rate / Cycle Time

The BiSS/SSI frame repetition rate (cycle time) can be adjusted by software. With AGSMIN the adapter starts a new BiSS/SSI frame as soon as possible.

FREQ_AGS(7:0)	R/W
Code	Frame repetition rate
0x00 ...0x7B	f_{sys} / [20 * (Code + 1)]
0x7C	AGSMIN
0x7D ...0x7F	"not permitted"
0x80 ...0xFF	f_{sys} / [625 * (Code - 127)]
Notes	f_{sys} = 20 MHz (internal system clock)

Table 2: BiSS/SSI frame repetition rate

MO Line Control

The MO+ is connected to GND and MO- is connected to VDD. Thus, MO line control is disabled and the start bit of a BiSS frame cannot be delayed by the BiSS master.

DESIGN REVIEW: Notes On Device and Cable

iC-MB5 iCSY MB5U 0		
No.	Function, Parameter/Code	Description and Application Hints
1	Additional MA and MO Signal termination 120Ω inside adapter.	Additional VDD load inside the MB5U
2	USB cable 1.8m long dissipates power supply of adapter and BiSS/SSI device on high BiSS/SSI device load on VDD.	Use shorter cable on critical power situations
3	Noise on VDD and GND may disturb sensitive analog signal setup.	Separate VDD and supply external VDD

Table 3: Notes on device functions regarding iC-MB5 iCSY MB5U release ”0”

iC-MB5 iCSY MB5U Z		
No.	Function, Parameter/Code	Description and Application Hints
1	Termination inside adapter 120 Ω on MA and MO signals removed .	Less VDD load inside the MB5U
2	Different USB cable 1.8m long for higher power demand of adapter and high current load of BiSS/SSI device on VDD.	Higher power capability by cable
3	Noise reduction on VDD and GND.	Reduced
4	Shipments from iC-Haus GmbH	As of November 2017

Table 4: Notes on device functions regarding iC-MB5 iCSY MB5U release ”Z”

iC-MB5 iCSY MB5U Y		
No.	Function, Parameter/Code	Description and Application Hints
1	Noise reduction on VDD and GND.	Reduced
2	Shipments from iC-Haus GmbH	As of June 2018

Table 5: Notes on device functions regarding iC-MB5 iCSY MB5U release ”Y”

iC-MB5 iCSY MB5U X		
No.	Function, Parameter/Code	Description and Application Hints
1	New DC-DC converter	Improved field power supply output voltage
2	Shipments from iC-Haus GmbH	As of March 2020

Table 6: Notes on device functions regarding iC-MB5 iCSY MB5U release ”X”

iC-MB5 iCSY MB5U X1		
No.	Function, Parameter/Code	Description and Application Hints
1	New DC-DC converter	Improved field power supply output voltage
2	Shipments from iC-Haus GmbH	As of February 2021

Table 7: Notes on device functions regarding iC-MB5 iCSY MB5U release ”X1”

EU DECLARATION OF CONFORMITY

EU Konformitätserklärung
EU Declaration of Conformity

1.	Gerätetyp/Produkt *Apparatus model/Product*	Adapter USB 2.0 <-> BiSS
2.	Name und Anschrift des Herstellers *Name and address of the manufacturer*	Gottinger Instruments GmbH Ilzleite 34, 94034 Passau, Germany
3.	Die alleinige Verantwortung für die Ausstellung dieser Konformitätserklärung trägt der Hersteller. *This declaration of conformity is issued under the sole responsibility of the manufacturer.*	
4.	Gegenstand der Erklärung *Object of the declaration*	MB5U
5.	Der oben beschriebene Gegenstand der Erklärung erfüllt die einschlägigen Harmonisierungsrechtsvorschriften der Union. *The object of the declaration described above is in conformity with the relevant Union harmonisation legislation.* RICHTLINIE 2014/30/EU DES EUROPÄISCHEN PARLAMENTS UND DES RATES vom 26. Februar 2014 zur Harmonisierung der Rechtsvorschriften der Mitgliedstaaten über die elektromagnetische Verträglichkeit *DIRECTIVE 2014/30/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 26 February 2014 on the harmonisation of the laws of the Member States relating to electromagnetic compatibility*	
6.	Angabe der einschlägigen harmonisierten Normen, die zugrunde gelegt wurden, einschließlich des Datums der Norm, oder Angabe anderer technischer Spezifikationen, für die die Konformität erklärt wird, einschließlich des Datums der Spezifikation: *References to the relevant harmonised standards used, including the date of the standard, or references to the other technical specifications, including the date of the specification, in relation to which conformity is declared:* *DIN EN 55022; VDE 0878-22:2011-12 - Einrichtungen der Informationstechnik - Funkstöreigenschaften - Grenzwerte und Messverfahren (CISPR 22:2008, modifiziert); Deutsche Fassung EN 55022:2010* *DIN EN 55024; VDE 0878-24:2016-05 - Einrichtungen der Informationstechnik - Störfestigkeitseigenschaften - Grenzwerte und Prüfverfahren (CISPR 24:2010 + Cor.:2011 + A1:2015); Deutsche Fassung EN 55024:2010 + A1:2015*	
7.	Nicht zutreffend. *No applicable.*	
8.	Zusatzangaben *Additional information*	--
	Unterzeichnet für und im Namen von: *Signed for and on behalf of:*	Gottinger Instruments GmbH
	Ort und Datum der Ausstellung: *place and date of issue*	Passau, 25. April 2016
	Name und Funktion *name, function*	Reinhard Gottinger, Geschäftsführer *Reinhard Gottinger, Managing Director*

Figure 2: EU Declaration of Conformity

REVISION HISTORY

Rel.	Rel. Date*	Chapter	Modification	Page
A1	2015-04-22		Initial release.	

Rel.	Rel. Date*	Chapter	Modification	Page
A2	2015-06-02	ORDERING INFORMATION	The CABLE1 variant ”iC-MB5 iCSY MB5U-CABLE1” is obsolete.	7

Rel.	Rel. Date*	Chapter	Modification	Page
B1	2018-01-16	ABSOLUTE MAXIMUM RATINGS	ABSOLUTE MAXIMUM RATINGS updated, partial transfer into ELECTRICAL CHARACTERISTICS.	4, 5
		ELECTRICAL CHARACTERISTICS	ABSOLUTE MAXIMUM RATINGS updated, partial transfer into ELECTRICAL CHARACTERISTICS.	4, 5
		MU1C ADAPTER AND CABLE SET	MU1C chapter updated.	5
		SENSOR SUPPLY THROUGH USB	Chapter SENSOR SUPPLY THROUGH USB added.	6
		MU1C ADAPTER AND CABLE SET	The iC-MU EVAL MU1C contains the extension cable to MU1C.	6
		DESIGN REVIEW: Notes On Device and Cable	Chapter added.	9
		EU DECLARATION OF CONFORMITY	Chapter added.	9
		ORDERING INFORMATION	Adding general information: the box includes cable USB (type A ↔ Mini B).	12

Rel.	Rel. Date*	Chapter	Modification	Page
C1	2018-12-21	ABSOLUTE MAXIMUM RATINGS	Item G001 updated	4
		ABSOLUTE MAXIMUM RATINGS	Item G002 conditions updated	4
		ABSOLUTE MAXIMUM RATINGS	Item G004 removed	4
		ELECTRICAL CHARACTERISTICS	Item 001, 102 conditions updated	5
		ELECTRICAL CHARACTERISTICS	Item 101 updated	5
		ELECTRICAL CHARACTERISTICS	Item 2xx and 3xx header updated pin names + / -	5
		DESIGN REVIEW: Notes On Device and Cable	Revision ”Y” added	9

Rel.	Rel. Date*	Chapter	Modification	Page
C2	2020-03-01	ELECTRICAL CHARACTERISTICS	Item 101 updated	5
		BiSS SOFTWARE ENVIRONMENT	Links for download packages and DLL updated	8
		DESIGN REVIEW: Notes On Device and Cable	Revision ”X” added	9

Rel.	Rel. Date*	Chapter	Modification	Page
D1	2022-08-08	All	Overall update Updated Subtitle Removed software list	All
		APPLICATIONS	Reviewed applications	1
		DESCRIPTION	Removed BUA note	2
		CONNECTORS	USB type Mini-B added	3
		ELECTRICAL CHARACTERISTICS	Added Vusb	5
		FUNCTIONAL NOTES	Described TTL and equidistant data acquisition functionality.	6

* Release Date format: *YYYY-MM-DD*

ORDERING INFORMATION

Type	Package	Options	Order Designation
MB5U	55 mm x 22 mm x 85 mm Aluminium blue anodized	The box includes • MB5U • USB cable (type A ↔ Mini-B)	iC-MB5 iCSY MB5U

Please send your purchase orders to our order handling team:

Fax: +49 (0) 61 35 - 92 92 - 692
E-Mail: dispo@ichaus.com

For technical support, information about prices and terms of delivery please contact:

iC-Haus GmbH
Am Kuemmerling 18
D-55294 Bodenheim
GERMANY

Tel.: +49 (0) 61 35 - 92 92 - 0
Fax: +49 (0) 61 35 - 92 92 - 192
Web: http://www.ichaus.com
E-Mail: sales@ichaus.com

Appointed local distributors: http://www.ichaus.com/sales_partners