MB5U

High Performance isolated BiSS to PC Adapter (USB)

preliminary

FEATURES

- USB 2.0 high speed PC interface
- FPGA based logic
- Hardware implemented interface protocols
- Fast realtime data communication (10 MHz BiSS; 4 MHz SSI)
- API for Windows: BiSS-Interface DLL
- Field capable design: box, field interfaces, USB bus powered
- Galvanic isolation
- USB powered
- VDD 5 V supply up to 250 mA for external applications
- Supported interfaces:
  BiSS / SSI controlled by FPGA application

APPLICATIONS

- BiSS / SSI application development
- BiSS / SSI debugging
- Flexible interface configuration
- Encoder calibration
- Portable applications

SYSTEM VIEW

DESCRIPTION

The MB5U is a PC-USB 2.0 high speed interface BiSS master based on FPGA logic system design.

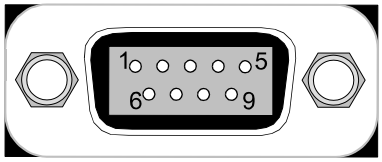
BiSS Interface Functions and Features:

- Up to 8 BiSS slaves
- RS422 10 MBit/s maximum data transfer rate
- SSI master
- BiSS C unidirectional and BiSS C master
- BiSS master MB100 BiSS IP based
- USB 2.0 interface up to 30 MBit/s data transfer
- USB 1.1 interface compatibility to 12 MBit/s data transfer
- Adapter USB bus powered
- Devices adapter powerable
- FPGA integrated 1st level RAM
- Available drivers for 32- and 64 bit versions of the following platforms:
  - Windows 10
  - Windows 8.1
  - Windows 8
  - Windows 7
  - Windows Vista
  - Windows XP
  - Windows Embedded 8 Standard
  - Windows Embedded Standard 7 (WES7)
  - Windows Embedded Enterprise Windows Embedded POSReady
  - Windows Embedded Server Windows XP embedded
  - Windows Server 2012 R2 Windows Server 2012
  - Windows Server 2008 R2 Windows Server 2008
  - Windows Server 2003
  - Windows Home Server.

The device offered here is a multifunctional device that contains integrated BiSS C interface components. The BiSS C process is protected by patent DE 10310622 B4 owned by iC-Haus GmbH. Users benefit from the open BiSS C protocol with a free license which is necessary when using the BiSS C protocol in conjunction with this iC.
Download the license at www.biss-interface.com/BUA

CONNECTORS

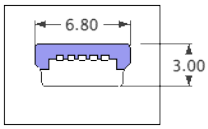
PIN CONFIGURATION BiSS



PIN FUNCTIONS

No.	Name	Function
1	n.c.	Not connected
2	MA+	Clock output P
3	MA-	Clock output N
4	VDD	Logic power supply
5	MO-	Master data output N
6	GND	Ground (0 V)
7	SL+	Device data input P
8	SL-	Device data input N
9	MO+	Master data output P

PIN CONFIGURATION Mini USB



PIN FUNCTIONS

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

PIN CONFIGURATION MU1C cable, sensor side J2 (optional, see Ordering Information)

PIN FUNCTIONS

No.	Name	Function
1	VDD	Logic power supply (5 V)
2	GND	Ground (0 V)
3	SLO+	Device data output P
4	SLO-	Device data output N
5	MA+	Master clock input P
6	MA-	Master clock input N

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	Temp	Temperature Range		0		50	°C
T02	HUM	Humidity	non condensing	5		95	%

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...5.5 V, T = 0 . . . 50 °C, unless otherwise noted.

Item No.	Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
USB Power Supply Input (VUSB)							
001	I(VUSB)	Maximum current consumption from USB bus	See USB 2.0 specifications			500	mA
Field Power Supply Output (VDD)							
101	VDD	Field Power Supply Output Voltage	I(VDD) = 0 mA . . . maximum as specified in 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
Field RS-422 Outputs MA+ / MA- / MO+ / MO-							
201	f(max)	Maximum Communication Frequency	50% duty cycle			10	MHz
202	PHY	RS4xx output specification Z and Y	See TI ISO3086 datasheet				
Field RS-422 Inputs SL+ / SL-							
301	f(max)	Maximum Communication Frequency	50% duty cycle			10	MHz
302	Ri	Input Resistance, terminator	Between SL+ and SL-		120		Ω
303	PHY	RS4xx output specification A and B	See TI ISO3086 datasheet				

GALVANIC ISOLATION OF POWER SUPPLY, GND, BiSS SIGNALS AND SHIELD

The MB5U provides VDD, GND, Shield and the BiSS signals MA+, MA-, MO+, MO-, SL+ and SL- with galvanic isolated. The MB5U field GND and shielding potential does not need to be identical with the adapter GND and adapter shield to prevent ground loops and potential differences.

Note:
MB5U is galvanically isolated. A common GND potential (field and host) and shield potential is not required.

BiSS POWER SUPPLY CONTROL

The MB5U supplies the VDD voltage only with allocating and initializing the adapter. With closing the adapter resource or the software the voltage is turned off to permit a safe unplugging of connected devices. Non volatile content needs to be saved e.g. in an EEPROM before closing the interface adapter in any software environment.

Note:
MB5U may not be supplied into VDD. If the sensor needs to be supplied by 3rd power supply, the GND needs to be identical and any backwards supply into VDD of the adapter MB5U is not permitted.

BiSS MASTER IP MB100

The MB5U is based on the MB100 BiSS master IP. With this implementation it is possible to connect one or more BiSS C devices or a single SSI device to the adapter. BiSS C protocol is fully supported. The adapter supports up to 8 BiSS C slave devices.

With BiSS there is 10 MBit/s RS422 maximum clocking available. The SSI protocol operation is also configurable.

With high speed buffered transfer the real-time measured data can be block-wise transferred to a Windows PC application for analysis, documentation, data processing, etc..

SENSOR SUPPLY THROUGH USB

The output voltage VDD and output current I(VDD) of the adapter do dramatically depend on the used PC, USB port and the used USB cable. On critical applications regarding sensor supply voltage and high sensors current consumption the shipped USB cable may cause a cruicial voltage drop.

Note:
On critical applications it is recommended to reduce the USB cable length.

On critical applications it is recommended to choose a high quality and high current capable USB cable.

The shipped USB cable has a high quality and a high current capability.

MU1C ADAPTER AND CABLE SET

The iC-MU EVAL MU1C contains the extension cable to MU1C. This cable connects MU1C with the BiSS interface and does supply the MU1C board with VDD and GND.

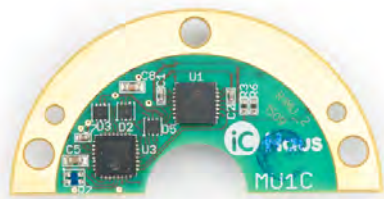


Figure 1: MU1C

For more details please check:
http://www.ichaus.com/MU1C

BiSS SOFTWARE ENVIRONMENT

iC-Haus Evaluation Software

iC-Haus BiSS software for PCs running on Windows operating systems as well as the required USB drivers are available as a ZIP file. iC-Haus software built with LabVIEW™ requires the installation of the LabVIEW™ Run-Time Engine (RTE). The RTE must be installed only once, hence there are two download links available:

	Download package without RTE (small size)	Download package including RTE (big size)
BiSS	http://www.ichaus.de/BiSS_gui	http://www.ichaus.de/BiSS_gui_rte
iC-NQ	http://www.ichaus.de/NQ_gui	http://www.ichaus.de/NQ_gui_rte
iC-NQC	http://www.ichaus.de/NQC_gui	http://www.ichaus.de/NQC_gui_rte
iC-MH	http://www.ichaus.de/MH_gui	http://www.ichaus.de/MH_gui_rte
iC-MH8	http://www.ichaus.de/MH8_gui	http://www.ichaus.de/MH8_gui_rte
iC-MH16	http://www.ichaus.de/MH16_gui	http://www.ichaus.de/MH16_gui_rte
iC-MHL100	http://www.ichaus.de/MHL100_gui	http://www.ichaus.de/MHL100_gui_rte
iC-MHL200	http://www.ichaus.de/MHL200_gui	http://www.ichaus.de/MHL200_gui_rte
iC-MHM	http://www.ichaus.de/MHM_gui	http://www.ichaus.de/MHM_gui_rte
iC-MU	http://www.ichaus.de/MU_gui	http://www.ichaus.de/MU_gui_rte
iC-MU150	http://www.ichaus.de/MU150_gui	http://www.ichaus.de/MU150_gui_rte
iC-MU200	http://www.ichaus.de/MU200_gui	http://www.ichaus.de/MU200_gui_rte
iC-MN	http://www.ichaus.de/MN_gui	http://www.ichaus.de/MN_gui_rte
iC-MNF	http://www.ichaus.de/MNF_gui	http://www.ichaus.de/MNF_gui_rte
iC-MR	http://www.ichaus.de/MR_gui	http://www.ichaus.de/MR_gui_rte
iC-MR3	http://www.ichaus.de/MR3_gui	http://www.ichaus.de/MR3_gui_rte
iC-MD	http://www.ichaus.de/MD_gui	http://www.ichaus.de/MD_gui_rte
iC-PZ	http://www.ichaus.de/PZ_gui	http://www.ichaus.de/PZ_gui_rte
iC-RZ	http://www.ichaus.de/RZ_gui	http://www.ichaus.de/RZ_gui_rte
iC-TW29	http://www.ichaus.de/TW29_gui	http://www.ichaus.de/TW29_gui_rte

Note:
The compatibility with the MB5U adapter depends on the individual software release and is subject to individual timeline. Please check http://www.ichaus.de/software for individual release status.

iC-Haus BiSS Interface DLL

For custom software running on Windows operating systems the BiSS Interface DLL enables rapid software development. Direct access to eval board adapter and high level protocol functions are directly available.

The BiSS DLL revision 6.0 and higher supports multiple MB5U adapter in one application.
Download BiSS Interface DLL: http://www.ichaus.de/biss1sl_interface

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 4: 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	After November 01, 2017

Table 5: 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	After June 15, 2018

Table 6: 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	After March 01, 2020

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

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 updated	8
		DESIGN REVIEW: Notes On Device and Cable	Revision ”X” added	9

* 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 and cable USB (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:

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Am Kuemmerling 18
D-55294 Bodenheim
GERMANY

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Web: http://www.ichaus.com
E-Mail: sales@ichaus.com

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