MIKROE

mikroBUS

Standard specifications

Revision history:

| Revision Number:	Revision Date:	Summary of changes:	Authors:
3.00	April, 2019	Introduced new connector options, updated font, removed add-on board section, introduced new terms and conditions of use.	S.T., D.K.
2.10	January, 2018	Added standard mikroBUS connectors.	S.T, D.K.
1.00	August, 2011	Initial mikroBUS™ standard, introducing the pinout and the add-on board concept.	A.N.

Index

Introduction

The mikroBUS™ standard defines mainboard sockets used for interfacing microcontrollers or microprocessors (mainboards) with integrated circuits and modules (add-on boards).

The standard specifies the physical layout of the mikroBUS™ pinout, the communication and power supply pins used, the positioning of the mikroBUS™ socket on the mainboard, and finally, the silkscreen marking conventions for both the sockets.

The purpose of mikroBUS™ is to enable easy hardware expandability with a large number of standardized compact add-on boards, each one carrying a single sensor, transceiver, display, encoder, motor driver, connection port, or any other electronic module or integrated circuit.

Created by MikroElektronika, mikroBUS™ is an open standard — anyone can implement mikroBUS™ in their hardware design, as long as the requirements set by this document are being met.
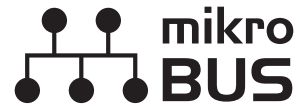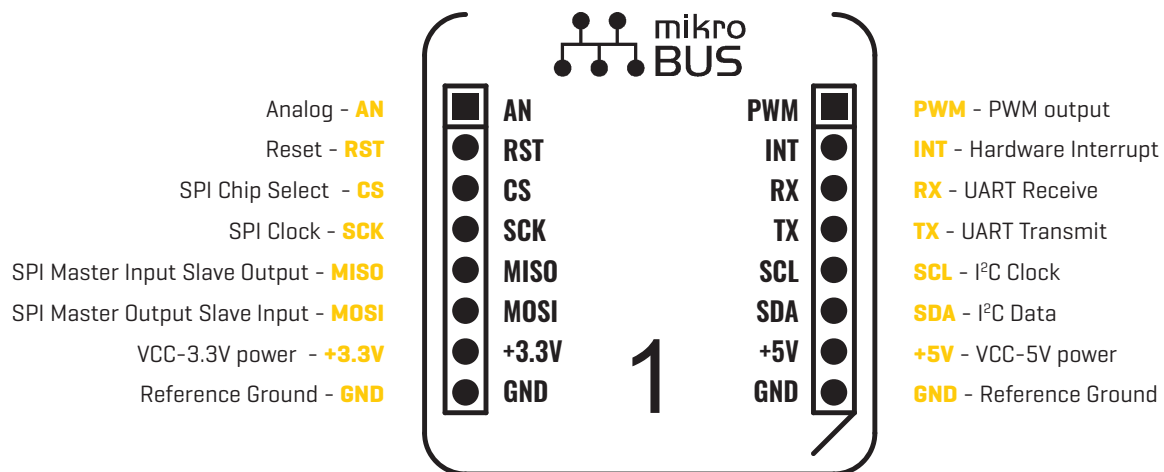
Socket standard

*T*he mikroBUS™ socket comprises a double row 16-pin female socket with a proprietary pin configuration and silkscreen markings. The pinout [always laid out in the same order] consists of three groups of communications pins [SPI, UART and I²C], six additional pins [PWM, Interrupt, Analog input, Reset and Chip select], and two power groups [+3.3V and GND on the left, and 5V and GND on the right 1x8 header]. The spacing of pins is compatible with standard [100 mil pitch] breadboards.

NOTE: The following pages contain detailed specification on how to implement mikroBUS™ sockets into your hardware design. The easiest way to ensure that your design is in accordance with the prescribed standards, is to use our Altium Designer template files. Download them from: *www.mikroe.com/mikrobus*

Pinout specification

|	
Analog - **AN**	**PWM** - PWM output
Reset - **RST**	**INT** - Hardware Interrupt
SPI Chip Select - **CS**	**RX** - UART Receive
SPI Clock - **SCK**	**TX** - UART Transmit
SPI Master Input Slave Output - **MISO**	**SCL** - I²C Clock
SPI Master Output Slave Input - **MOSI**	**SDA** - I²C Data
VCC-3.3V power - **+3.3V**	**+5V** - VCC-5V power
Reference Ground - **GND**	**GND** - Reference Ground

Pin functions/silkscreen markings for the socket

Silkscreen markings

To preserve the integrity of the mikroBUS™ standard, it's important to always include the mikroBUS™ logo and the default mikroBUS™ pin names on the silkscreen markings. It is preferable to retain the full mikroBUS™ silkscreen markings, but a few alternatives are also permitted.

Full mikroBUS™ silkscreen markings
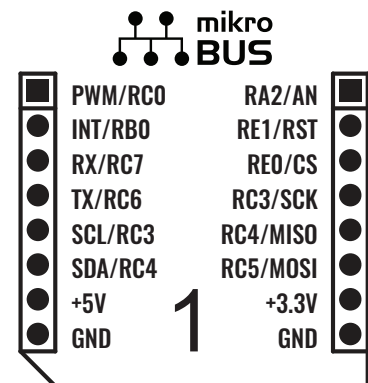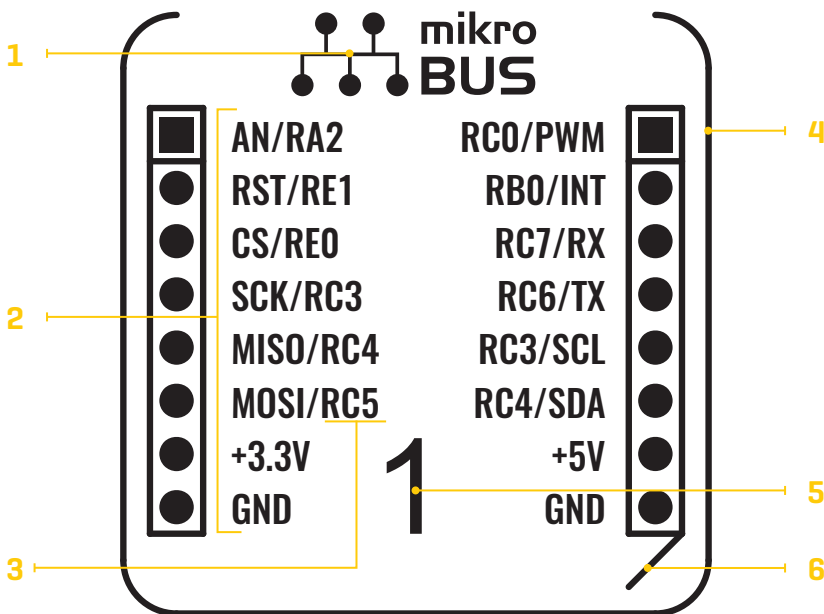
Front view

1. mikroBUS™ logo positioned above the socket

2. Pin names corresponding to the mikroBUS™ standard; font used Oswald Medium 5pt

3. Pin names corresponding to the routing of the mainboard

4. A line that encloses the socket on all sides except the top, as shown above

5. Socket number, necessary only when multiple sockets are on the same board.

6. A diagonal notch below the right-hand side pinout (serves as a guideline for

   add-on board insertion)

Rear view

The full mikroBUS™ silkscreen markings also include the print on the backside of the board. While the front of the board often contains a lot of components making it difficult to retain the full markings, the backside rarely has such constraints. Therefore, even when deviating from the full silkscreen markings (see next page), designers are required to retain the markings on the backside.

Alternative front markings positioning

It's not always possible to retain the full silkscreen markings (either because the space between the pins is populated with other components, or the socket is near the edge of the board). In those cases, designers should follow these guidelines.
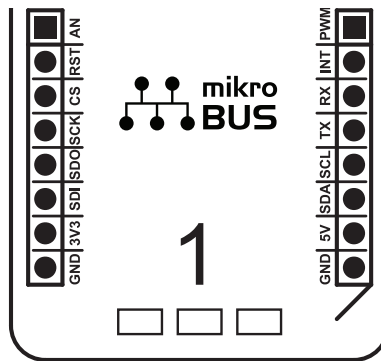
1) mikroBUS™ logo

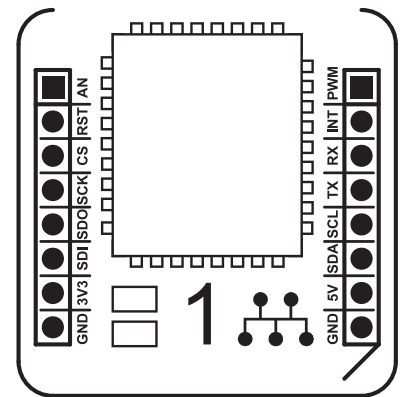When the logo can't be printed in the default top position, it can be placed:

- A -
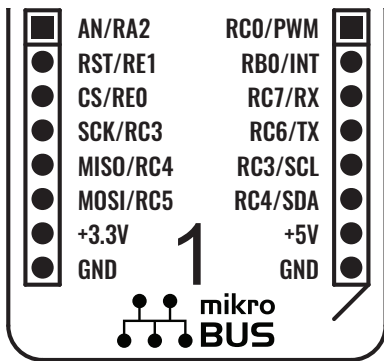
In the bottom position

- B -

Anywhere in the space between the pins (requires pin names to be printed out vertically)
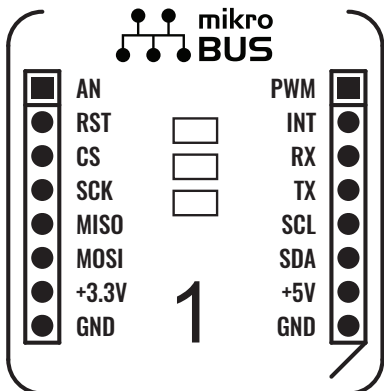
- C -

without the mikroBUS™ type — however, the full logo must still be present on the backside of the board.
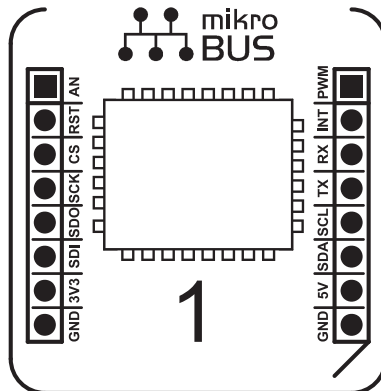
2) Pin markings

To save space, pin markings can be:

- A -

Shortened to include only the default pin names of the mikroBUS™ standard
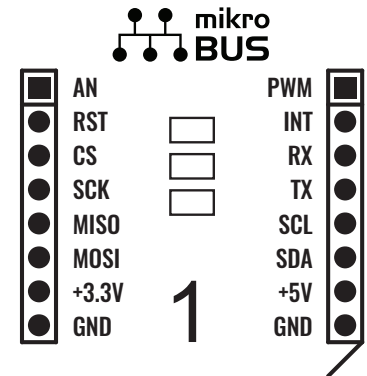
- B -

Printed vertically. In this case, MOSI turns into SDO and MISO turns into SDI.

3) Silkscreen outline

The silkscreen outline can also be left out...

...but the bottom right notch should be preserved because it ensures proper add-on board insertion.

Placement requirements

A mainboard can contain one or more mikroBUS™ sockets. More sockets allow more add-on boards and the number of possible add-on board combinations grows exponentially. The upper limit is imposed by the I/O on the mainboard microcontroller (such considerations are beyond the scope of this standard and are subject to good engineering practises). Adhere to these guidelines when placing sockets:
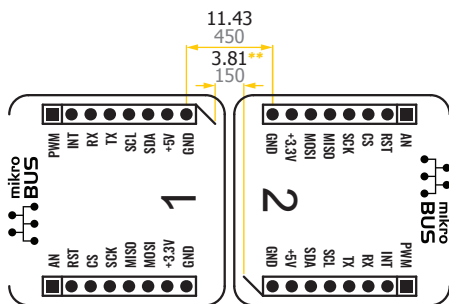
Dimensions
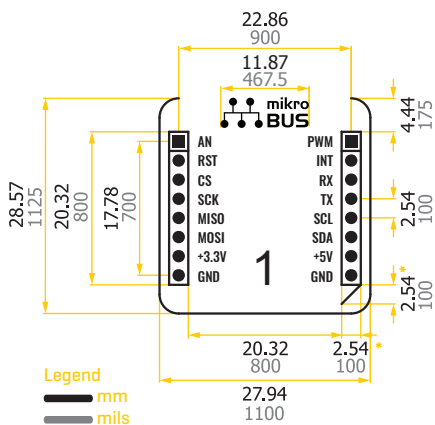
In-line placement
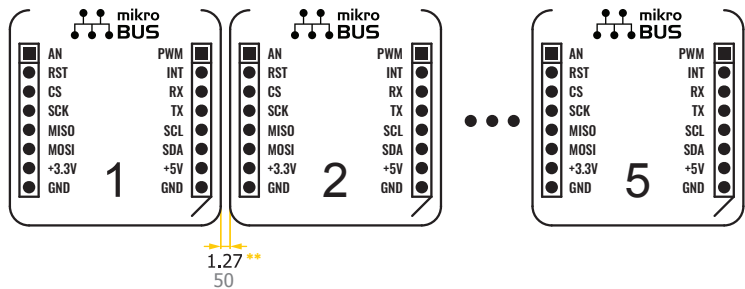
Bottom-to-bottom placement

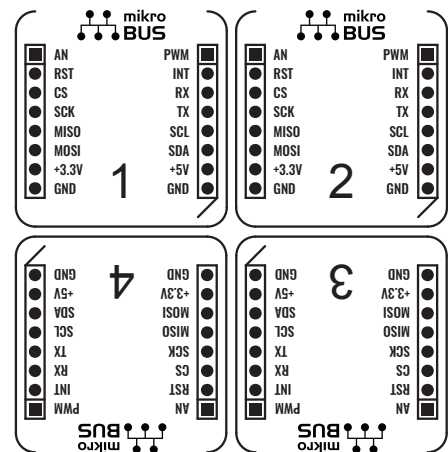The mikroBUS™ silkscreen markings should be oriented upright relative to the socket — not the entire board. Thus, in the bottom to bottom placement, the socket number and other markings are written out opposite to each other.

Socket numbering

Multiple sockets in two rows should be enumerated in clockwise direction.

*   depending on the connector type

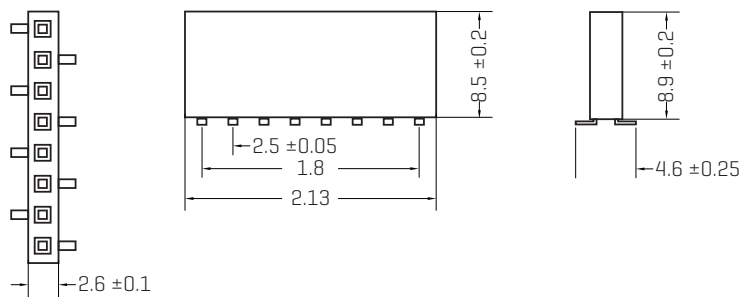**   minimum distance requirements

Connectors

There are 6 standard mikroBUS™ connector types.

mikroBUS™ SMT *(Surface-mount technology)*

VERSION A – 1x8 2.54mm pitch female SMT header - LEFT pin

VERSION B – 1x8 2.54mm pitch female SMT header - RIGHT pin
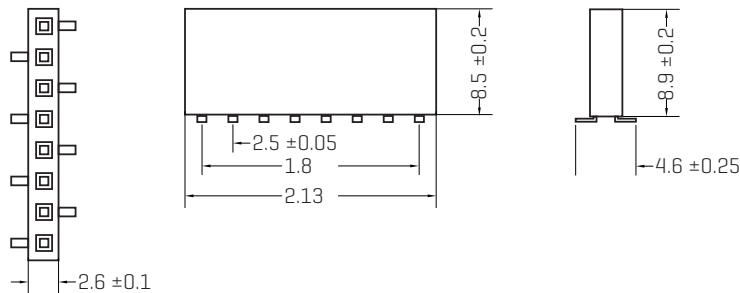
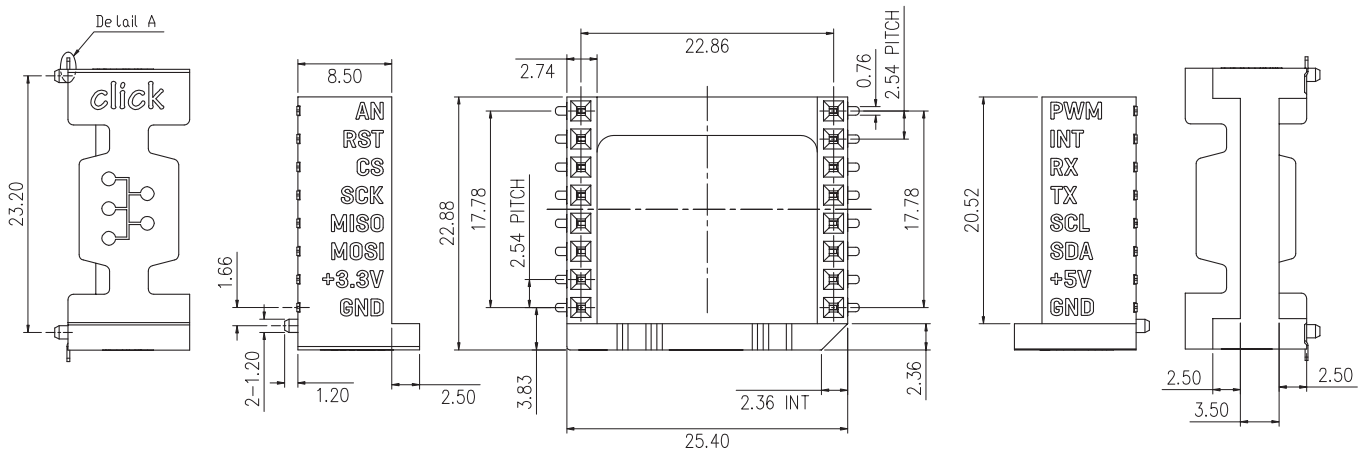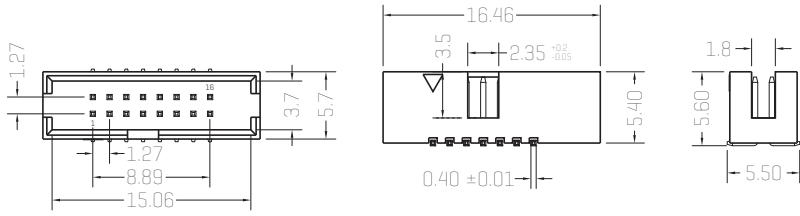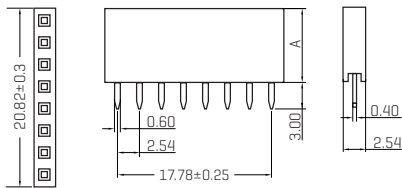**VERSION C – Mikroe propriatory mikroBUS™ SMT connector**
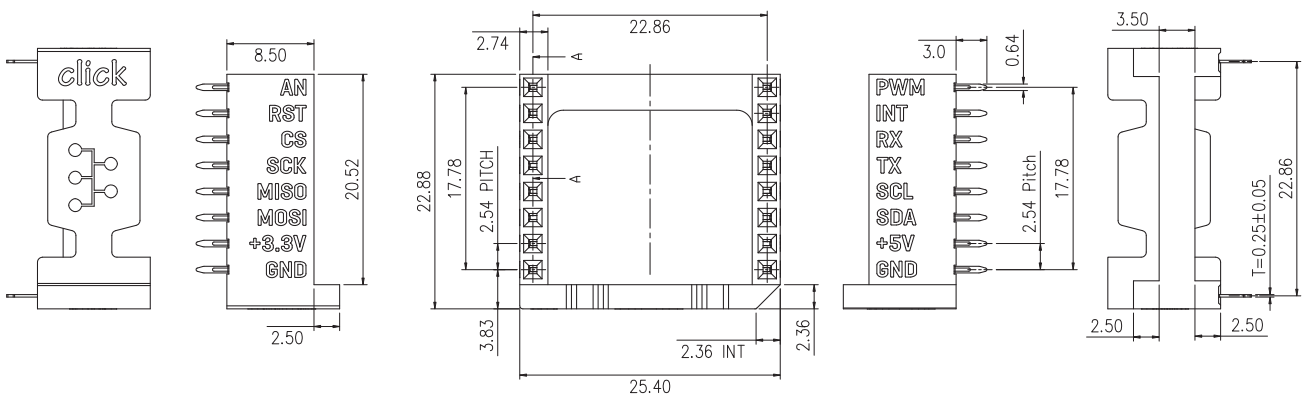
VERSION D – mikroBUS™ shuttle SMT connector

mikroBUS™ TH *(Through-hole technology)*

VERSION E – 1x8 2.54mm pitch female TH header

VERSION F – Mikroe propriatory mikroBUS™ TH connector

Terms & Conditions of Use

I. CONDITIONS OF USE

1.1 By using, copying, modifying or distributing the mikroBUS™ Standard, you accept this License, agree to comply with its terms and become a "Licensee."

1.2 All Licensee's rights under this License shall terminate if he or she fails to comply with any of the material terms or conditions of this License and does not cure such failure in a reasonable period of time after becoming aware of such noncompliance. However, the rights of others who have received the mikroBUS™ Standard, directly or indirectly from Licensee will not be terminated so long as they are in compliance with the License themselves.

1.3 If all Licensee's rights under this License terminate, Licensee agrees to cease use and distribution of the mikroBUS™ Standard as soon as reasonably practicable. However, Licensee's obligations under this Agreement shall continue and survive.

1.4 Licensee agrees not to offer or impose any terms on the mikroBUS™ Standard that alters or restricts the applicable version of this License or any other party's rights hereunder.

1.5 This License does not apply to software or code loaded into programmable devices which may be used in conjunction with the mikroBUS™ Standard. Such software is subject to the license terms established by its copyright holder(s).

1.6 MikroElektronika and each subsequent Licensor grants every other Licensee and every possessor or user of the mikroBUS™ Standard a perpetual, world-wide and royalty-free immunity from suit under any patent, patent application or other intellectual property right which he or she controls to the extent necessary to make, possess, use or distribute the mikroBUS™ Standard.

1.7 If you use the mikroBUS™ Standard, you grant every other Licensor, Licensee and other possessor of the mikroBUS™ Standard a perpetual, worldwide and royalty-free immunity from suit under any patent, patent application or other intellectual property right which you control to the extent necessary to make, possess, use or distribute the mikroBUS™ Standard. This immunity does not extend to infringement arising from modifications subsequently made by others.

1.8   These grants of immunity are a material part of this License. If you are prevented and/or not authorized to grant the immunity required by this Section, your rights under this License will terminate and you may no longer use, copy, modify or distribute the mikroBUS™ Standard.

1.9   If it is impossible for Licensee to comply with any terms of this License with respect to the mikroBUS™ Standard due to statute, judicial decree or regulation, then Licensee agrees to comply with the terms of this License to the maximum extent possible under the law.

1.10 Licensee agrees to implement the mikroBUS™ Standard in a manner consistent with the terms and conditions of this License. Licensee may deviate from this License in its implementation of the mikroBUS™ Standard only upon the express written consent of MikroElektronika.

II.   NO WARRANTY

2.1   EXCEPT AS EXPRESSLY SET FORTH IN THIS LICENSE, THE MIKROBUS™ STANDARD IS PROVIDED ON AN "AS IS" BASIS, WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, EITHER EXPRESS OR IMPLIED INCLUDING, WITHOUT LIMITATION, ANY WARRANTIES OR CONDITIONS OF TITLE, NON-INFRINGEMENT, MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

2.2   Each Licensee is solely responsible for determining the appropriateness of using and distributing the mikroBUS™ Standard and assumes all risks associated with its exercise of rights under this License, including but not limited to the risks and costs of program errors, compliance with applicable laws, damage to or loss of data, programs or equipment, and unavailability or interruption of operations.

III.   DISCLAIMER OF LIABILITY

3.1   MIKROELEKTRONIKA SHALL NOT HAVE ANY LIABILITY FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING WITHOUT LIMITATION LOST PROFITS), HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OR DISTRIBUTION OF THE MIKROBUS™ STANDARD OR THE EXERCISE OF ANY RIGHTS GRANTED HEREUNDER, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

3.2   You agree that the foregoing limitations are reasonable due to the non-financial nature of the transaction(s) represented by this License and acknowledge that were it not for these limitations, MikroElektronika would not be willing to make the mikroBUS™ Standard available to you.

3.3   You agree to defend, indemnify and hold MikroElektronika harmless from any claim brought by a third party alleging any defect in the design, manufacture or operation of the mikroBUS™ Standard pursuant to this License.

3.4   Licensee agrees not to remove or alter the substance of any license notices, including intellectual property notes, disclaimers of warranty or limitations of liability contained in this License

IV.   MISCELLANEOUS

4.1   This License represents the complete agreement concerning the subject matter described herein.

4.2   If any provision of this License is invalid or unenforceable under applicable law, it shall not affect the validity or enforceability of the remainder of the terms of this License, and without further action by the parties hereto, such provision shall be reformed to the minimum extent necessary to make such provision valid and enforceable.

4.3   If a Licensee institutes patent litigation against any third-party alleging that the mikroBUS™ Standard infringes such Licensee's patent(s), then such Licensee's rights granted under this License shall terminate as of the date such litigation is commenced.

4.4   Everyone is permitted to copy and distribute copies of this License. MikroElektronika reserves the right to publish new versions (including revisions) of this License from time to time. No one other than MikroElektronika has the right to modify this License.

4.5   Except as provided under this License, Licensee receives no rights to the intellectual property of MikroElektronika. This License does not grant any rights in the trademarks, service marks or logos of MikroElektronika, except as may be necessary to comply with the its terms and conditions.

4.6   All rights in the mikroBUS™ Standard not expressly granted under this License are reserved.

4.7   This License is governed by the laws and the intellectual property laws of the Republic of Serbia.

Appendix

Placement recommendations

The mikroBUS™ standard does not dictate the layout of the mainboard beyond the sockets. It's the responsibility of designers to ensure their mainboards are compatible with add-on boards for intended applications. Recommendations below are based on a few reoccurring scenarios. Furthermore, to accommodate Click boards™ as the largest range of mikroBUS™ compatible add-on boards please read Click boards™ standard.

Don't place components that could obstruct add-on boards

Don't forget to leave room when enclosing your hardware in a casing
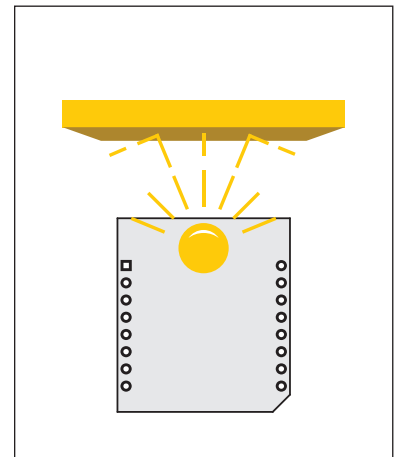
Don't obscure sensors
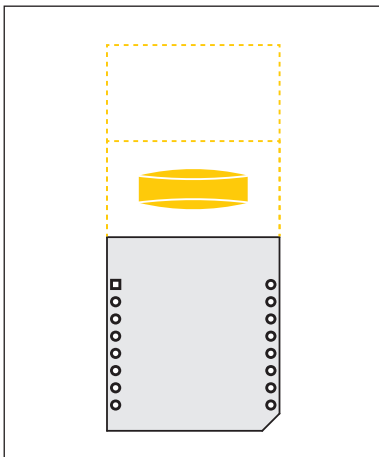
mikroBUS™ add-on boards extend beyond the socket. Placing the socket near tall components like screw terminals, Ethernet ports etc. could pose a barrier to add-on boards.
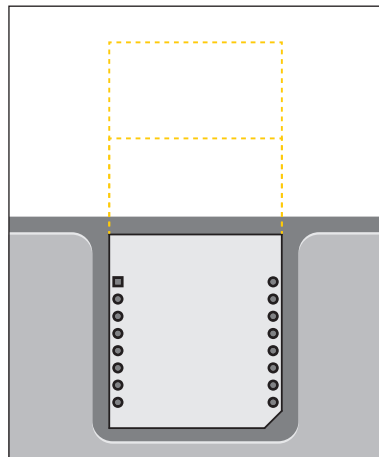
If you plan to enclose the mainboard in a casing, place the sockets so that add-on boards can't portrude beyond the edge of the board.

On the other hand, keep in mind that add-on boards have various sensors that can work only under proper conditions. For example, sensors intended to measure ambient temperature shouldn't be placed near heat sinks, UV sensors have to be exposed and so on. Evaluate the application of your mainboard and implement sockets accordingly.

MIKROE