Agrident GmbH, Steinklippenstr. 10, D-30890 Barsinghausen
Phone +49 5105 582573-10 - Fax +49 5105 582573-17

ABR200
Integration Manual

Firmware v1.12 and higher

V14/07/16

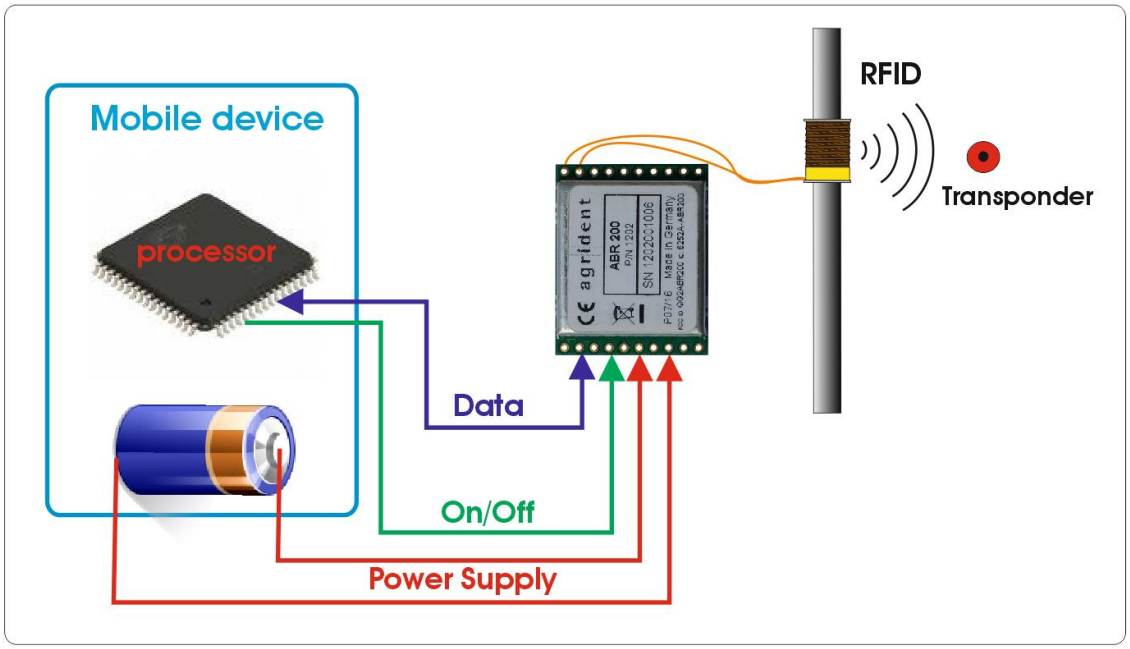
July 2016

Agrident GmbH
Steinklippenstr. 10
30890 Barsinghausen
Germany
Phone +49 (0) 51 05 582573-10
Fax +49 (0) 51 05 582573-17
E-Mail: mail@agrident.com
www.agrident.com

Content

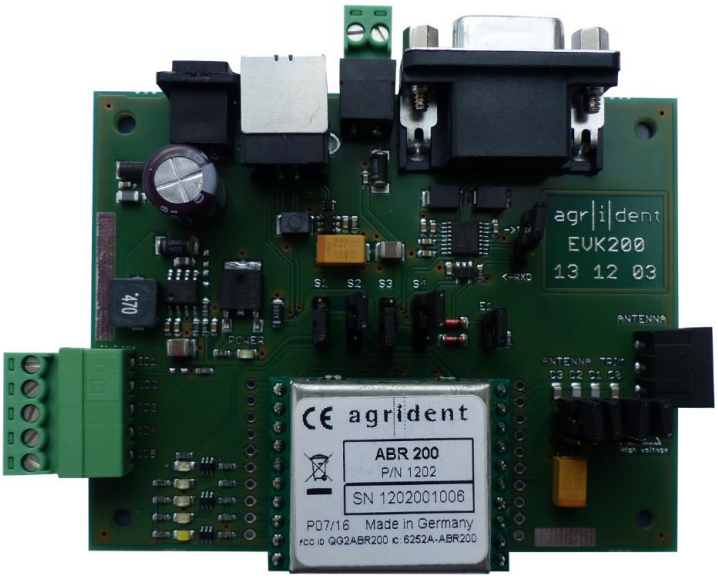
1 Introduction

The ABR200 is a low frequency ISO11784/11785 compliant OEM RFID reader module working on 134.2 KHz. It has been designed for the integration into mobile devices like PDAs. The ABR200 is not intended to be used as a stationary reader. For stationary readers you should use a model from the ASR range.



Agrident provides an Evaluation Board in order to make the development of an own software interface easier for customers. In case of using the ABR200 with the Evaluation Kit, the reader board is powered by voltage regulators which are supplied with 12 to 24V from a DC power supply. The reader can be connected to a desktop PC using the RS232 or the USB connector on the Evaluation Board. However, this setup is different from the use of the reader board in the final application and has the purpose to evaluate the ABR200 only.

The next picture shows the evaluation board for the ABR200 OEM reader module. For further details about the evaluation board please see the separate document "*EVK200_Evaluation_Board_for_ABR200_eng.pdf*"

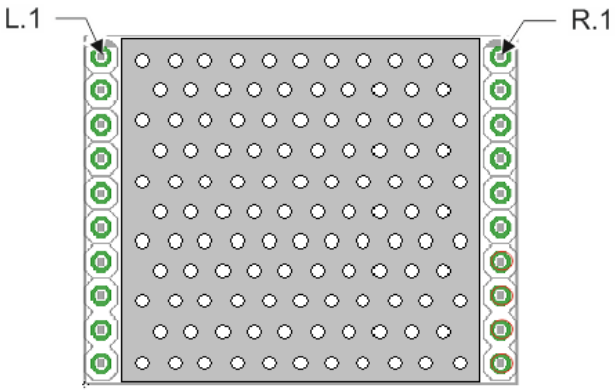


EVK200 evaluation board with ABR200

2 Pinout

The ABR200 has one connection terminal on the left side an another one on the right side. Each terminal has 10 pins and the pitch is 2.54mm. The pin assignment can be found in the table below.

	Left	Right
1	USB-DP	Ant-1
2	USB-DM	Ant-2 (CP)
3	UART-RXD	Ant-3 (CP)
4	UART-TXD	GND
5	GND	ENABLE
6	GPIO1	GND
7	GPIO2	5V-IN
8	GPIO3	5V-OUT
9	GPIO4	GND
10	GPIO5	BAT-IN



The orientation of the drawing on the left side matches with the orientation of the picture on the right side.

3 Power Supply options

The ABR200 is quite flexible concerning the choice of the power supply. The two different options for supplying the reader module with power are listed below.

- 2.2V – 4.5V DC (e.g. Lithium battery or 3 NiMH cells in series)
- 5V from voltage regulator (linear, stabilized, low ripple voltage)

For both options the power supply should be stabilized as good as possible. Ripple and noise should be reduced to a minimum, otherwise the reading performance might suffer.

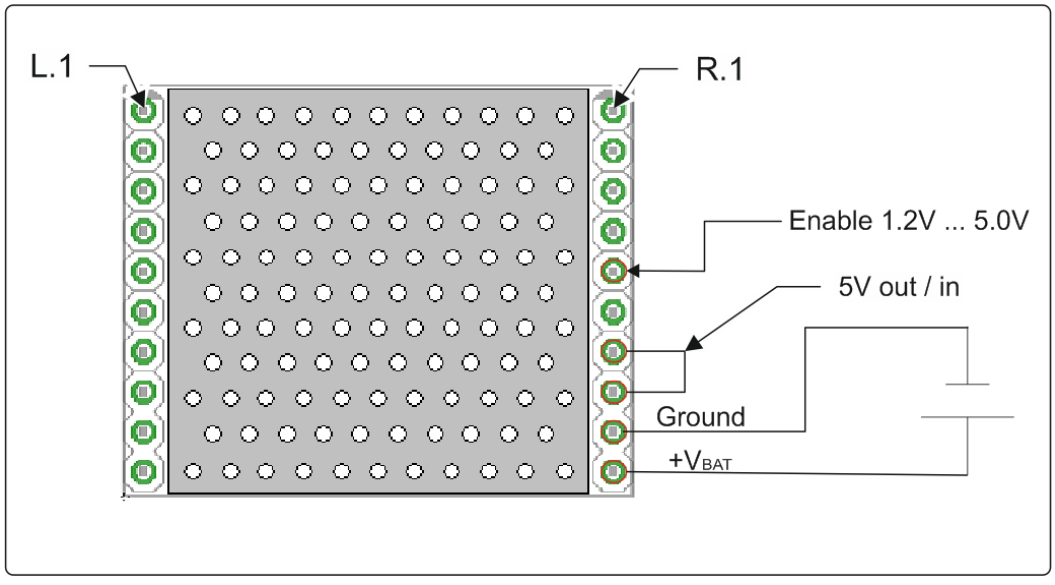
If the power source is a switch-mode regulator, the switching frequency of the converter should be as high as possible. The ABR200 also offers the possibility to synchronize other converters with a multiple of the RF frequency, which is the best possible scenario for avoiding EMI problems caused by external switch-mode regulators.

Generally a battery is the most stable power supply – there is no ripple and no noise. The ABR200s on-board step-up converter does not cause any problems because it runs synchronized with the RF field as well.

3.1 Power supply 2.2V – 4.5V

If the module should be connected to the battery of a mobile device, the ABR200s on-board boost converter needs to be used in order to supply certain parts of the module with 5.0 Volts. Therefore the battery voltage has to be connected to “BAT-IN” of the module. In addition there needs to be a connection between “5V-OUT” and “5V-IN”.

In order to enable the modules power supply, the “Enable” pin must be driven higher than 1.2V.

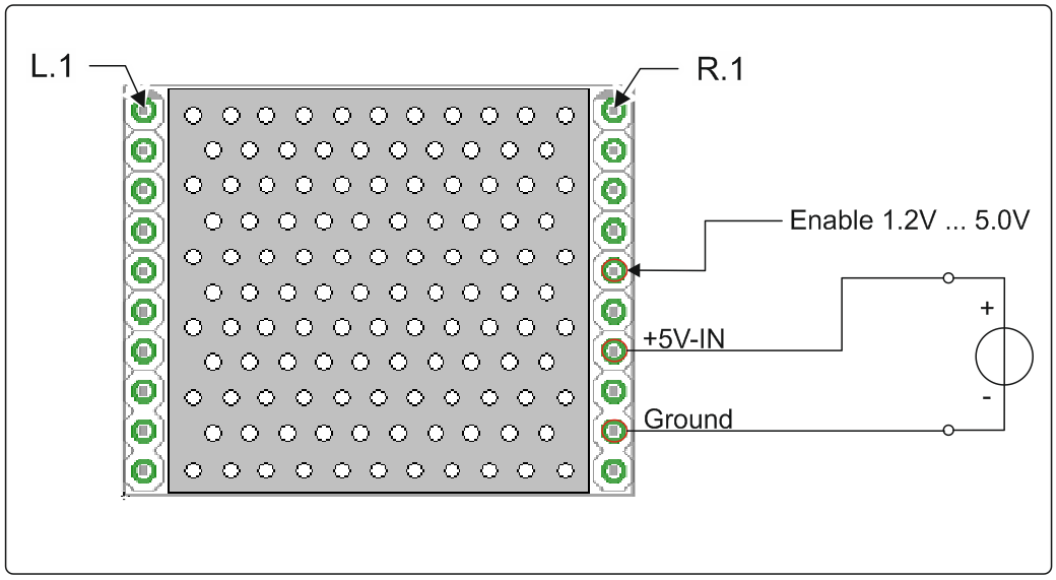


The above diagram shows the connection for input voltages between 2.2V and 4.5V.

3.2 Power supply 5.0V

In case the ABR200 should be supplied with 5.0V directly, the modules on-board boost converter is not used. The 5.0V have to be connected to the “5V-IN” pin of the reader. The pins “BAT-IN” and “5V-OUT” are not used here and should be left open.

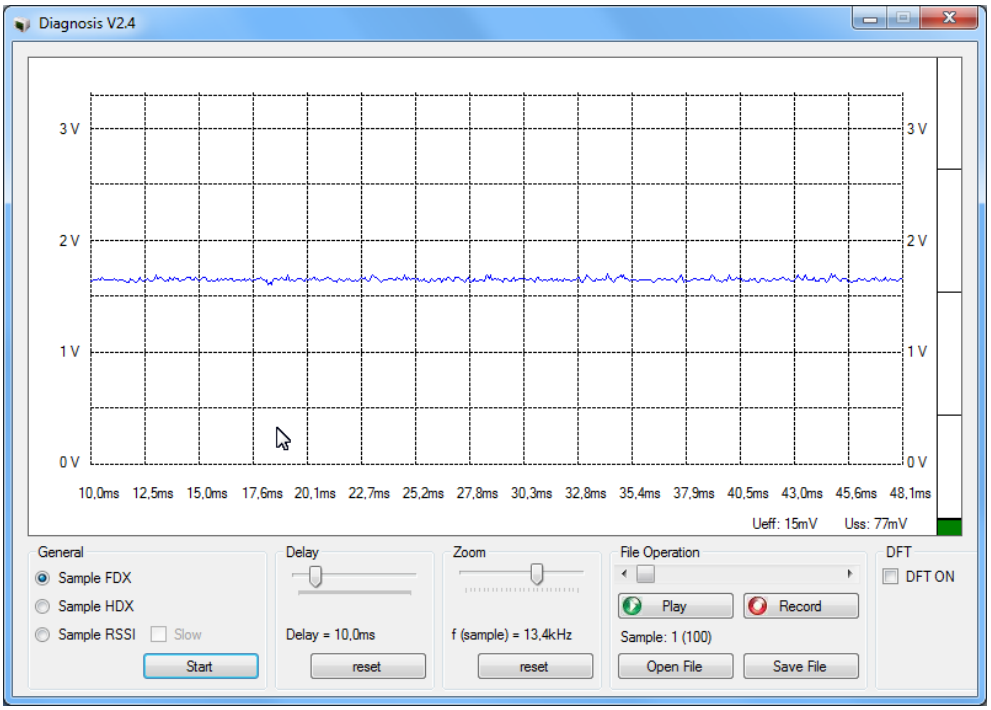
For switching on the ABR200s power supply, the “Enable” pin must be driven higher than 1.2V.



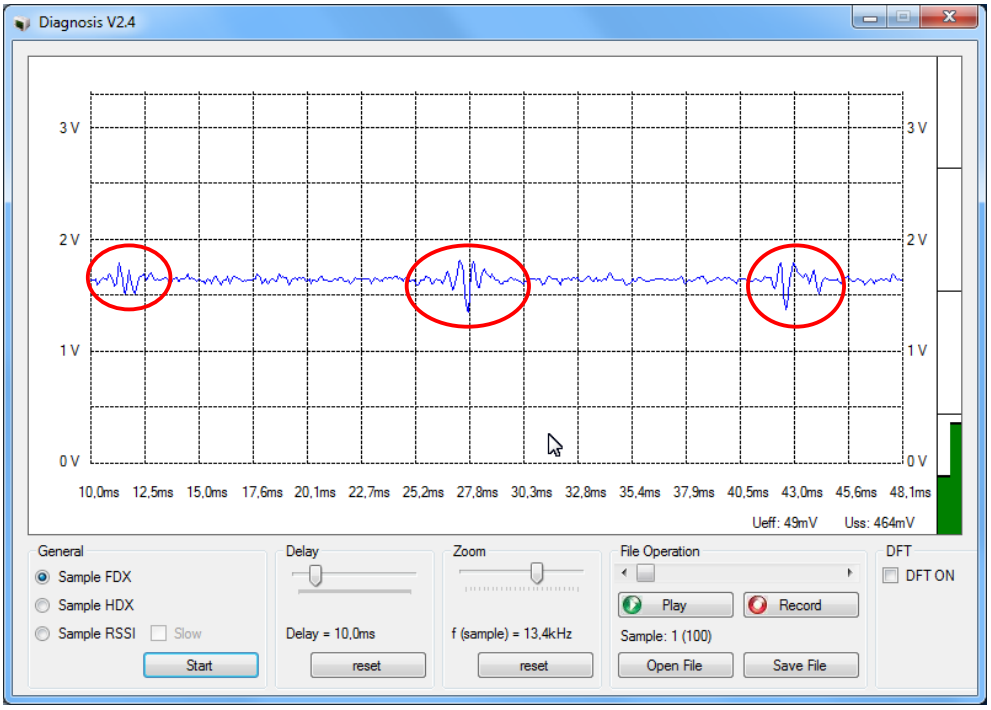
The diagram above shows the connection in case of providing 5.0VDC.

3.3 Power supply from 5V USB

A clean FDX signal is shown below. There is no noise present.



The next screenshot shows the same signal but in this case the module is directly supplied from the USB port of a computer.



The peaks you can see in the signal are caused by an instable USB voltage. The transmitter voltage on the module is not stable enough any longer and this causes the peaks in the signal. The FDX reading range will be reduced in this case, so please try to avoid using USB ports for supplying the module with power. The USB specification even allows the voltage to drop some hundred millivolt if a particular amount of current is drawn from the USB port. This is ok for most USB devices but not for sensitive RFID readers.

3.4 The ENABLE pin

The modules power supply has to be activated via the pin “Enable”. This applies to both power supply options, 2.2V to 4.5V or 5.0V. This pin must be driven higher than 1.2V - but 5.0V is the maximum - in order to switch on the ABR200. The maximum allowed voltage for keeping the reader deactivated is 0.4V.

The Enable line has an on-board pull-down resistor of 1MΩ in order to prevent floating levels.

4 Current consumption

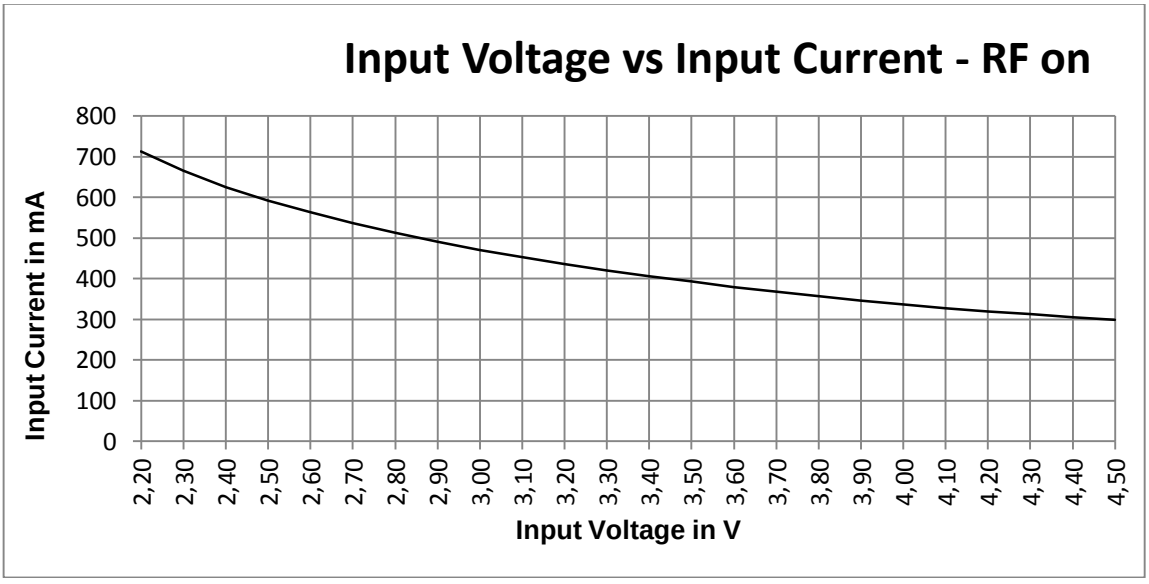
Generally there are three different operating states concerning power consumption:

1. ENABLE is low – the modules power supply is switched off
2. Enable is high and RF is on – the module is operating and RF is on
3. Enable is high and RF is off – the module is running but the field is not activated

4.1 Current consumption for 2.2V – 4.5V input voltage

In case the ABR200 should be powered from a battery, the modules on-board boost converter has to be used. This converter is able to generate 5.00V from input voltages in the range between 2.2V and 4.5V. The lower the input voltage, the higher the input current.

4.1.1 RF-on



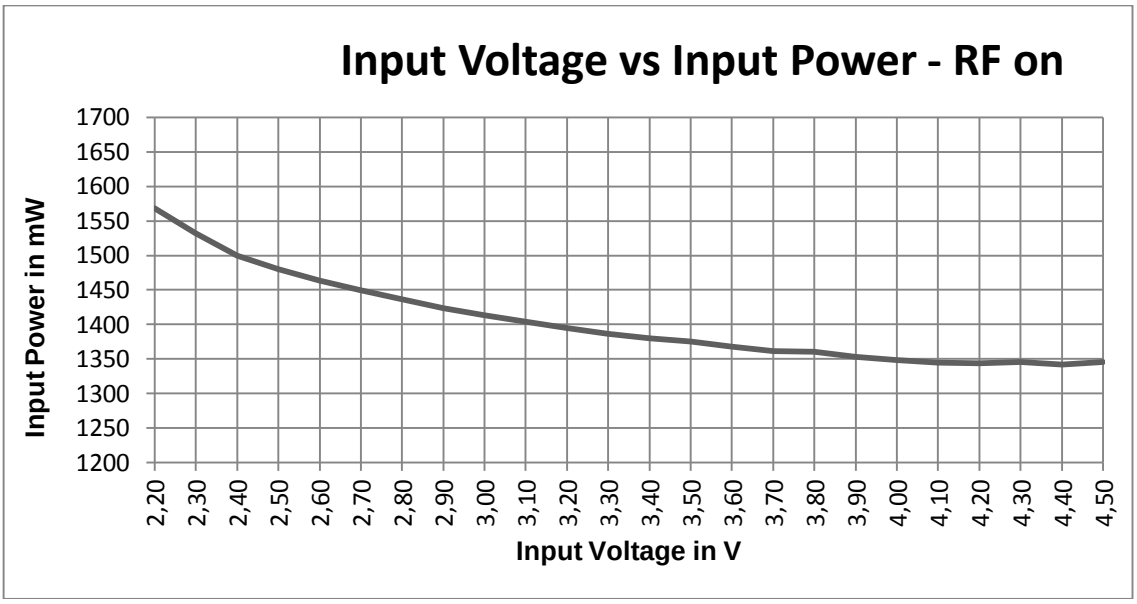
The diagram shows the current drawn from the battery depending on the battery voltage. As you can see, the current is higher than 700mA at 2.2 Volts input, which corresponds to a power consumption of more than 1.4W.

Here some detailed values from the specified input voltage range:

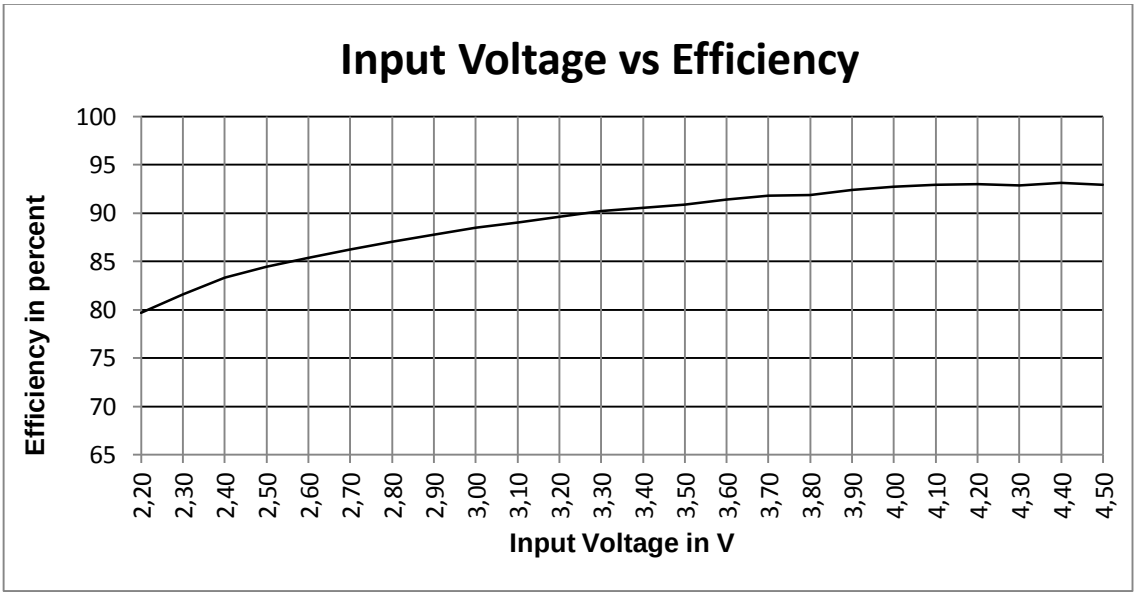
Voltage	2.2V	2.5V	3.0V	3.5V	4.0V	4.5V
Current	713mA	592mA	471mA	393mA	337mA	299mA

These values apply if the field is activated. The antenna used for these tests has a very high Q factor (Agrident 100mm ferrite antenna). If antennas with lower Qs are used, the current consumption will be lower accordingly.

The power consumption in this operating mode is shown below:



The power consumption decreases as the input voltage rises. This has to do with the efficiency of the ABR200s boost converter.

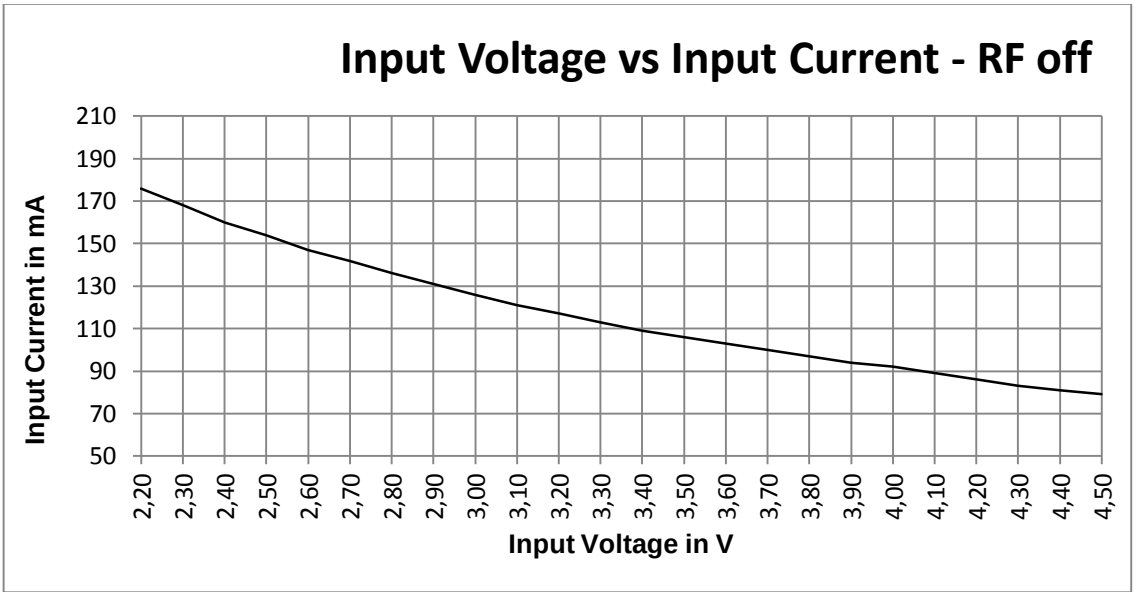


The efficiency of the converter is better at higher input voltages.

On the output side the converter delivers 5.00V. The current in RF-on mode is quite constant with about 250mA.

4.1.2 RF-off

When the RF is not activated, the current consumption is much lower.



Anyway, this is not really a “power saving mode” because the input currents are still in a range between 80mA (at 4.5V) and 175mA (at 2.2V). Thus it is highly recommended to shut down the ABR200 completely, after a tag has been read.

4.1.3 Power supply disabled

If the ENABLE pin is disabled (ENABLE lower than 0.4V), the input current is smaller than 4µA.

4.2 Current consumption for 5.0V input voltage

When the ENABLE pin is active (voltage between 1.2V and 5.0V) and the RF-field is activated, the current consumption of the ABR200 is about 250mA.

In case ENABLE is active but the RF-field is switched off, the current consumption is approximately 70mA.

If the ENABLE pin is low (voltage lower than 0.4V), the current consumption of the module is less than 1µA.

5 Interface options

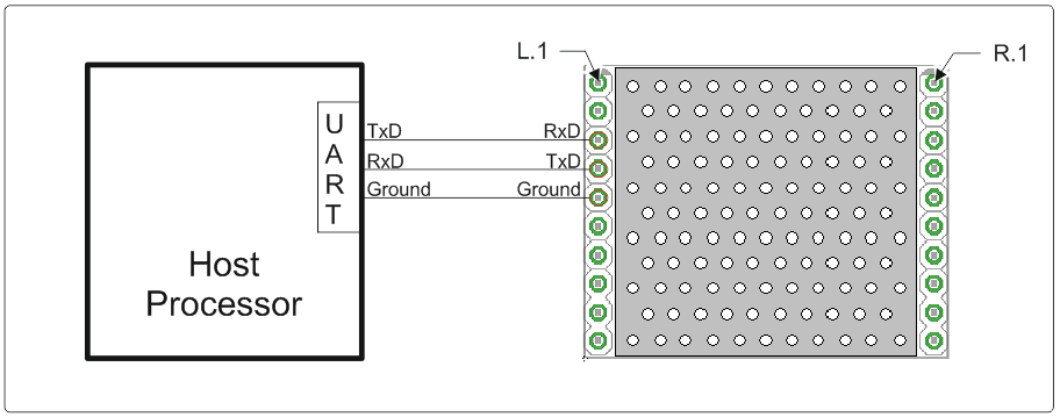
The ABR200 offers two different interface options, a UART interface and USB. Both are working independently of each other. Thus they could also be used simultaneously.

5.1 UART interface

The modules UART interface is working on 3.3V level but the RxD line is 5V tolerant. The TxD line always transmits at 3.3V and thus level shifters might be required if your UART only works at 5V (i.e.: if your UART is not 3.3V tolerant).

The ABR200 is using the following interface parameters:

- 9600 Baud to 115200 Baud (configurable, default is 9600)
- 1 Start Bit
- 8 Data Bits
- No Parity
- 1 Stop Bit



Please keep in mind that RxD and TxD need to be crossed. Where one device transmits data, the other device receives data and vice versa.

The TxD line contains a 1KΩ resistor on the ABR200 for current limiting in order to protect the processor on the reader.

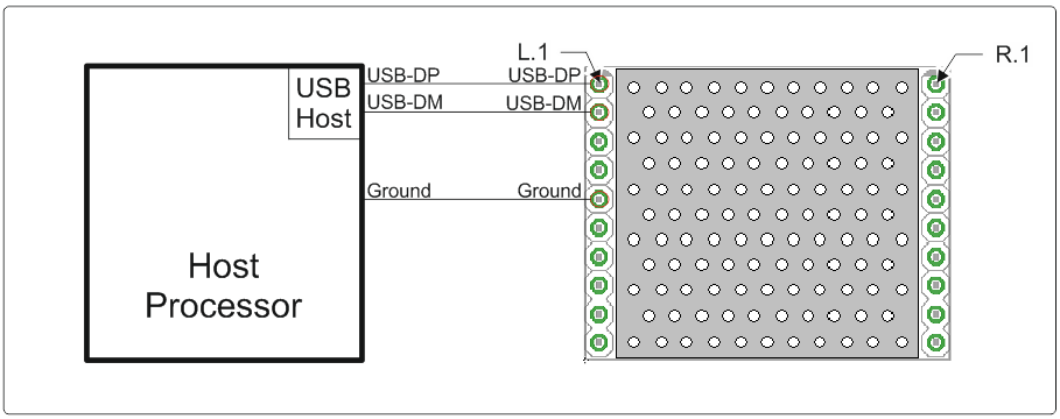
The RxD line contains a pull-up resistor to 3.3V and a diode in series on the ABR200. This ensures that the RxD level at the ABR200s processor cannot exceed 3.3V – even if another device uses 5V UART level.

Please ensure that the UART of your controller is configured to the same baud rate as the controller of the ABR200 – otherwise the communication will not work at all.

5.2 USB interface

The USB interface of the ABR200 is provided by the processor on the module. The interface uses USB-CDC (USB Communication Device Class). This is different to the previous reader module ABR105, which used an FTDI USB chip.

The USB data lines (USB-DP and USB-DM) are using a level of 3.3V as per USB specification.



The diagram above shows how to connect USB on the ABR200.

For USB the configured baud rate does not matter since the devices are negotiating the communication speed on their own in case of USB.

Agrident can already provide a USB driver installer for Windows desktop computers. Currently we are working on a solution for a driver for Windows CE and Windows Mobile. A driver for Android devices should be available here: https://code.google.com/p/usb-serial-for-android/.

6 The GPIOs

There are five GPIOs available on the ABR200. At the moment they are used for the following purposes:

GPIO	Input / Output	Function	Description
1	Output	Read	indicates a successful tag read
2	Output	RF-On	indicates that the RF-field is activated
3	Output	Power	indicates that the module power is switched on
4	RFU	RFU	reserved for future use
5	Output	PWM_Out	PWM output for synchronizing external switch-mode regulators; frequency depends on BAT-IN voltage

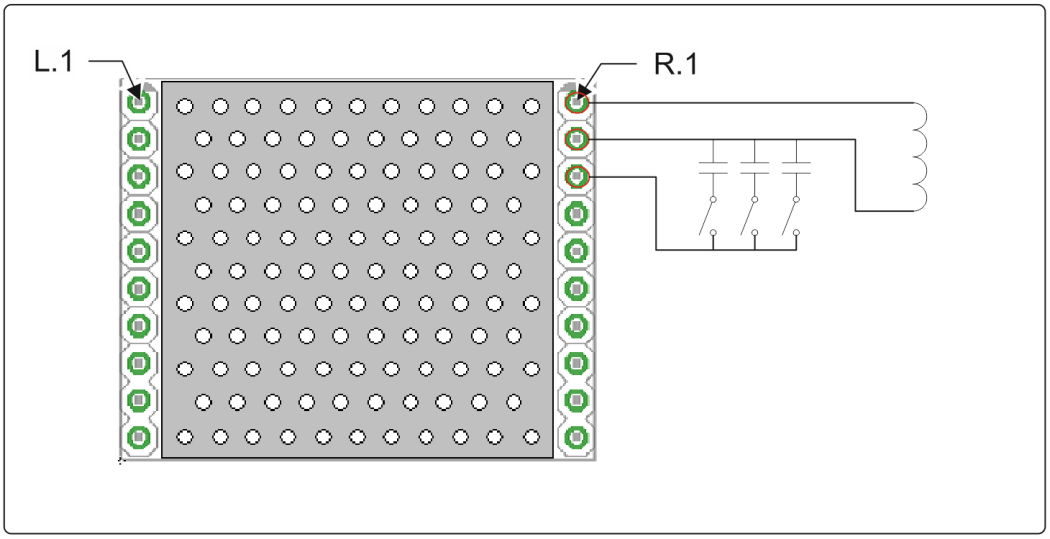
All GPIOs have 1KΩ series resistors on the ABR200 for current limiting and thus protecting the modules processor.

If you want to indicate particular events with LEDs directly from the ABR200 GPIOs, you have to use additional transistors. The GPIOs themselves cannot drive LEDs.

If you do not use particular GPIOs, please leave those pins open!

7 Connecting the antenna

The antenna has to be connected between pin 1 and pin 2 of the terminal on the right side.

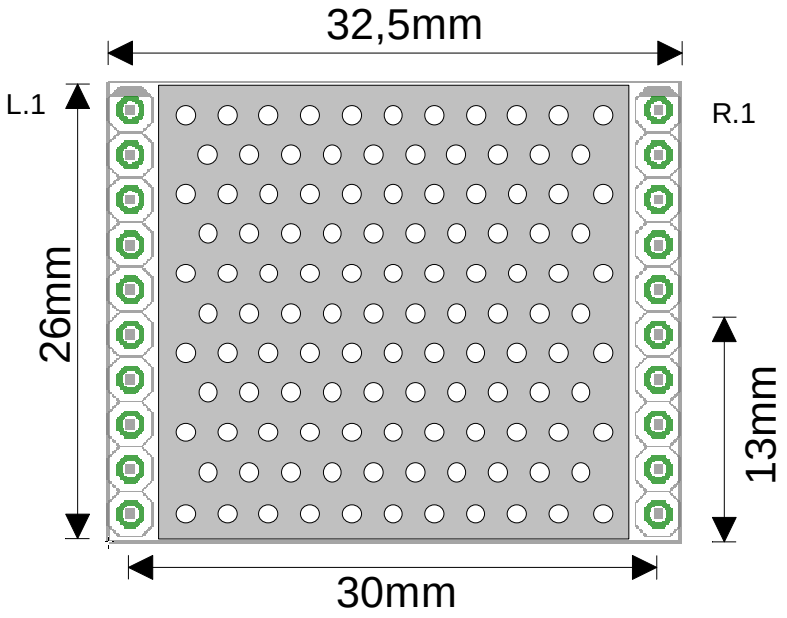


The ABR200 comes with the on-board resonant circuit capacitors tuned for antennas with an inductance of 275µH. That means you cannot use antennas with a higher inductance at all. If your antenna has a smaller inductance than 275µH – maybe because you have an air-coil antenna – you can add more capacitance between pin 2 and pin 3 as shown in the diagram above. The capacitors might be soldered to you PCB during production as fixed values or you can set them using jumpers like shown in this example.

However, tuning the circuit to resonance is always necessary in order to achieve the optimum reading performance. Please see the antenna tuning manual for further details.

For details concerning the location of antenna and module, please refer to the separate document *“ABR200_AN_Location_Antenna-Module_eng”*.

8 Mechanical Dimensions



Height	26 mm
Width	32,5 mm
Depth	8 mm

9 Mounting the ABR200

The ABR200 does not need any mounting bolts. It can be soldered to the customers PCB directly. Since it has two 10-pin connectors, one on the left and the other one on the right side, no additional fixing is required.

10 International Approvals

FCC and IC digital device limitations

The FCC approval is only valid with the tested antenna “ANT002”. If other antennas should be used, the complete FCC Part 15 B test procedure has to be repeated!

Any additional antenna may be used with this device, provided that the new antenna is from same type and has equal or lesser gain than the certified antenna(s). The usage of any new antenna type or higher gain antenna require either a Class II Permissive Change (add new antennas) by the Grantee (Agrident) or a complete new authorization under a new FCC ID by the responsible partyfor compliance.

Labeling of end product:

The final end-product must be labeled clearly visible with the following "*Contains FCC ID: QG2ABR200*" and "*Contains IC: 6252A-ABR200*"

If the size of the end-product is larger than 8 x 10 cm, the following FCC Part 15.19 statement shall be also placed on the device:

This device complies with Part 15 of the FCC Rules.

Operation is subject to the following two conditions:

(1) this device may not cause interference, and
(2) this device must accept any interference, including interference that may cause undesired operation of the device.

L'utilisation de ce dispositif est autorisée seulement aux deux conditions suivantes:

(1) il ne doit pas produire de brouillage, et
(2) l'utilisateur du dispositif doit être prêt à accepter tout brouillage radioélectrique reçu, même si ce brouillage est susceptible de compromettre le fonctionnement du dispositif.

If the size of the end product is too small (smaller than 8 x 10 cm) or it is not practicable to place this statement on the end-product; this statement shall be placed in a prominent location in the instruction manual or pamphlet supplied to the user or alternatively shall be placed on the container in which the device is sold.

User Manual of the end-product:

The end user has to be informed that any changes or modifications not expressly approved by the manufacturer could void the user's authority to operate this equipment.

FCC §15.105 Information to the user

(a) For a Class A digital device or peripheral, the instructions furnished the user shall include the following or similar statement, placed in a prominent location in the text of the manual:

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Canadian Radio Emissions Requirement

This Class A digital apparatus complies with Canadian ICES-003. Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.

CE MARKING

Hereby, Agrident GmbH declares that this equipment, if used according to the instructions, is in compliance with the essential requirements and other relevant provisions of the RTTE Directive 1999/5/EC. For use in all countries of the EU.

To obtain a copy, contact Agrident GmbH and request the "Declaration of Conformity" document for Multi-technology readers.

Agrident GmbH
mail@agrident.com

In case of alteration of the product, not agreed to by us, this declaration will lose its validity.

This symbol indicates proof of conformity to applicable European Economic Community Council directives and harmonized standards published in the official journal of the European Communities.

CE

11 Trouble shooting

For any problem please contact us:

Agrident GmbH
Steinklippenstr. 10
30890 Barsinghausen
Germany

Telephone +49 5105 582573-10
FAX +49 5105 582573-17

Mail: support@agrident.com