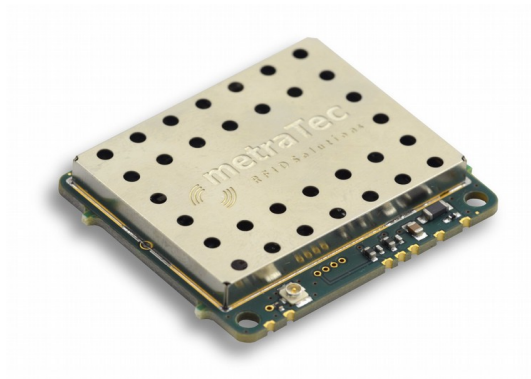# Technical Documentation

for metraTec DwarfG2 UHF RFID Module

Date: March 2021

Version: 1.3

Table of Contents

1 General Information / Security Advice

1.1 Notes on the Use of this Documentation

This user manual and integration guide uses different symbols to point out potentially dangerous situations. The following signs and symbols are used throughout the document.

ATTENTION

Declares a potentially hazardous situation. If this is not avoided, the product or something in its surrounding could be damaged.

NOTES

Declares notes for the user as well as other useful information, where no harmful or dangerous situations can be expected.

1.2 Security Advice

The DwarfG2 UHF RFID Module was not designed for use in dangerous environments. Using this product in applications where a failure could directly result in severe injuries or death ("high risk activities") is not permitted. This includes but is not limited to applications in nuclear facilities, flight control systems, life support systems or weapon systems. The manufacturer denies the suitability of this device for such scenarios.

1.3 Export Restriction

The DwarfG2 UHF RFID Module contains components that underlie US export restrictions. It is therefore forbidden to export the product to countries that are on the US trade embargo list. The same applies to any countries that are on the EU embargo list.

1.4 Further Documentation

While this documentation explains the electrical and mechanical characteristics of the DwarfG2 module, it might be useful to also read the metraTec UHF Protocol Guide, which explains the ASCII protocols used to control the module in full detail.

Source: http://www.metratec.com → Support → Downloads → Documentation

2 Product Description

The DwarfG2 UHF RFID Module is an easy to use RFID module which can be integrated into your electronics without big effort. This allows you to equip your product with RFID functionality without designing your own RF board. Thanks to the tested and extremely flexible firmware you can read and write data to any tag that follows the EPC Class 1 Gen 2 standard in no time. Even special features, e.g. sensor tags, can be used without firmware modifications. With the right external antenna a read range of up to 1m is possible.

Thanks to the quick firmware, the module is perfect for applications in printers and similar devices where high reading and writing speed is needed.

2.1 Intended Use

The DwarfG2 UHF RFID Module reads RFID tags that comply to the EPC Class 1 Gen 2 standard on a short range of up to 1m. For HF transponders that use the ISO 15693/14443 standards, please refer to our HF modules.

2.2 Technical Specification

Power Supply	5 V DC, 200 mA max.
Communication	5 V UART
Antenna Connector	U.FL
Transmit frequency	868 MHz (UHF RFID, ETSI)
RF output power	Up to 50 mW (configurable via Firmware)
Supported RFID Protocol	EPC Class 1 Gen 2
Temperature Range	-20 °C to +70 °C
Dimensions	40 x 36 x 6 mm

2.3 Module Overview
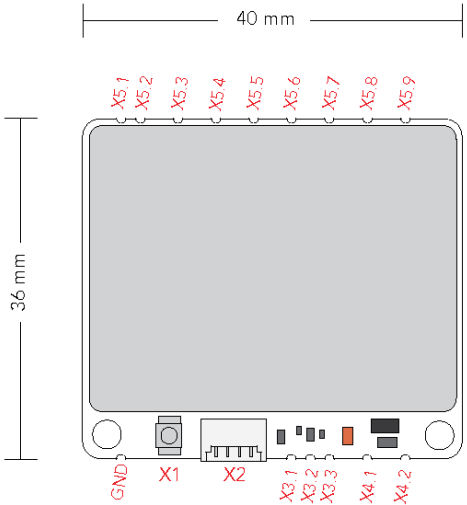

Fig. 1: Top View DwarfG2 Module

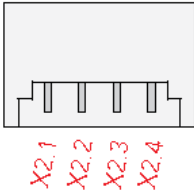*Fig. 2: Connector Overview of DwarfG2*

Fig. 3: Details of X2 connector

2.4 Scope of Delivery

The DwarfG2 UHF RFID Module comes with the following parts:

- DwarfG2 UHF RFID Module

- Documentation, Drivers and Demo Software are available via download from metraTec's website

2.5 Accessories

The following accessories and modules are available to extend and evaluate the functionality of the DwarfG2 UHF RFID Module:

- different external UHF OEM antennas

- different RFID tags suitable for almost every application

3 Power Supply and Power Consumption

The module does not feature a power supply nor reverse polarity protection. It is the task of the host board to supply a well filtered 5 V DC supply in order to achieve an optimum RFID performance. You either use the SMD vias X4.1 and X4.2 at the side to supply the module with power or two of the pins on connector X2.

Pin	Pin Function
X4.1 / X2.3	GND
X4.2 / X2.4	5 V DC

Tab. 1: Power Supply Pins

Supply voltage	5 V DC
Power consumption RF on	200 mA
Power consumption RF off	100 mA
Power consumption Stand-By	35 mA
GPIO voltage level	5 V

Tab. 2: DC characteristics

RFID systems require a very high level supply quality. Use linear regulators with high precision and high control speed whenever possible. When using switching power supplies make sure the switching speed is above 500 kHz and us an EMC optimized layout as well as shielded inductors.

4 Host Communication

The DwarfG2 UHF RFID Module communicates with its host using a 5 V UART connection. This enables direct connection to a host micro-controller. There is a range of circuits available to convert the 5 V UART Signal to RS232, RS422/485 or to USB or Ethernet. Please contact metraTec if you need advice on such converter circuits.

There are two ways to connect the module with a host:

1. Using the SMD vias X3.1 to X3.3 at the side of the module

2. Using the pins of connector X2

Pin	Pin Function
X3.1 / X2.1	Tx
X3.2 / X2.2	Rx
X3.3 / X2.3	GND

Tab. 3: UART connections

The UART commands used to control the DwarfG2 Module are described in the metraTec Protocol Guide. This guide comprises a detailed description of all commands, response formats and examples. As this protocol is shared among several metraTec products the guide is available in a separate document.

Please see: www.metratec.com --> Support --> Downloads --> Documentation

In the standard version the DwarfG2 UART works at 115.200 Baud, 8 databits, No parity, 1 Stopbit and no flow control.

5 RF Communication

The DwarfG2 Module uses an external antenna to send out RF power and data to the UHF transponder. Any 50 Ohm antenna which radiates at 868 MHz will work. There are several products available from metraTec which give you lots of options regarding form factor of the antenna as well as maximum read range.

You connect the external antenna to the module via the U.FL connector (X1) at the lower side of the module.

5.1 Digital Inputs/Outputs

The DwarfG2 Module has 8 digital Inputs/Outputs (X5) that can be set via the right firmware commands. These IOs are TTL level (5 V DC).

Via	Via Function
X5.1	GND
X5.2	Input/Output 1
X5.3	Input/Output 2
X5.4	Input/Output 3
X5.5	Input/Output 4
X5.6	Input/Output 5
X5.7	Input/Output 6
X5.8	Input/Output 7
X5.9	Input/Output 8

Tab. 4: GPIO vias

ATTENTION

Please make sure to only connect 5 V level to the GPIO vias. Many industrial devices use 24 V DC IOs which will destroy the module if connected without proper protection.

6 Certification

ATTENTION

Changes or modifications to the module not expressly approved by metraTec could void the user's authority to operate the equipment.

The DwarfG2 UHF RFID Module complies with ETSI Rule EN 302 208. Nonetheless, the integrator of the module has to make sure that all requirements are met by the final product. It is his obligation to declare product conformity. We recommend to assign this task to a qualified third-party test lab specialized on EMC measurements.

Product versions for regulations other than ETSI, e.g. FCC (USA) or CI (Canada) on request.

7 Further Notes

Electronic devices like the DwarfG2 UHF RFID Module are covered by the (German) ElektroG (electronic waste law) as well as the European WEEE directive and as such may not be disposed of by way of the normal household trash. Instead they have to be recycled properly. For you as our customer this is no additional burden, however, as you can send the device back to us for proper recycling. We assure you that the devices received back will be recycled properly and in an environmentally friendly way. Our WEEE Registration ID is DE 56060482.

When selecting electronic components we additionally made sure that all components are free of heavy metals and other harmful substances as required by the RoHS Directive for many industries. Hence, our products are produced in the most environmentally friendly way possible.

8 Version History

Version	Change	Changed by	Date
1.0	created	KD	16.05.2011
1.1	Chapters Certification and Further Notes added, minor changes	CS	18.06.2015
1.2	update address and image	KS	29.11.2016
1.3	Correct height inserted	TM	25.03.2021

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