User Manual

BIO-RAD

DTE4027 RFID Reader Module

REF DTE4027

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CAUTION

Please read through and familiarize yourself with the contents of the user manual.

ABOUT THIS MANUAL:

This manual is intended for design engineers and technicians. The following topics are included:

- Principles of Operation
- Technical Specifications
- Module in system integration
- Troubleshooting Guide

Also included are electrical and mechanical drawings.

WARNING TO USERS IN THE UNITED STATES

Federal Communication Commission Interference Statement 47 CFR Section 15.105(b)

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

This device DTE4027 complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

NO UNAUTHORIZED MODIFICATIONS

47 CFR Section 15.21

CAUTION: This equipment may not be modified, altered, or changed in any way without signed written permission from BIO-RAD. Unauthorized modification may void the equipment authorization from the FCC and will void the BIO-RAD warranty.

This device complies with FCC RF radiation exposure limits set forth for general population (uncontrolled exposure). This device must be installed to provide a separation distance of at least 20cm from all persons and must not be collocated or operating in conjunction with any other antenna or transmitter.

WARNING TO USERS IN THE CANADA / ATTENTION POUR LES UTILISATEURS AU CANADA

This device complies with Industry Canada licence-exempt RSS standard(s). 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.
Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada.
To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication.

This device complies with Industry Canada RF radiation exposure limits set forth for general population (uncontrolled exposure). This device must be installed to provide a separation distance of at least 20cm from all persons and must not be collocated or operating in conjunction with any other antenna or transmitter.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes: (1) il ne doit pas produire de brouillage, et (2) l'utilisateur du dispositif doit être prêt a accepter tout brouillage radioélectrique reçu, même si ce brouillage est susceptible de compromettre le fonctionnement du dispositif.
Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada.
Dans le but de réduire les risques de brouillage radioélectrique à l' intention d'autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante.

Le présent appareil est conforme aux niveaux limites d'exigences d'exposition RF aux personnes définies par Industrie Canada. Cet appareil doit être installé afin d'offrir une distance de séparation d'au moins 20cm avec l'utilisateur, et ne doit pas être installé à proximité ou être utilisé en conjonction avec une autre antenne ou un autre émetteur.

MODULE INTEGRATION SPECIAL WARNINGS FOR US & CANADA

- The DTE4027 module is considered as component that will be operated in combination with the final equipment. Then, the final equipment (including power supply system) still needs to re-confirm that the whole system complies with both intentional and unintentional emission requirements.
- We recommend that the minimum 20cm separation distance (for people & antennas/transmitter) should be mentioned in the end product documentation.
- The end product's regulatory label should mention: "Contains FCC ID: 2ABUUDTE4027 and IC: 11658A-DTE4027".
- The motherboard of final equipment where DTE4027 module is to be integrated must provide a power supply regulation to the module.

TRADEMARKS AND REFERENCES

1 INTRODUCTION

1.1 General Description

The Bio-Rad DTE4027 module is a complete read and write solution for 13.56 MHz Mifare Classic cards (1k, 4k).
It is designed to be integrated in an equipment in order to add RFID feature with low engineering and certification efforts.

2 SPECIFICATIONS

2.1 Physical Specifications

2.1.1 Dimensions

Width:	70 mm
Height:	40 mm

2.1.2 Weight

Board alone:	10 g

2.2 Technical Specifications

2.2.1 General Specifications

Power Input Requirements:	5VDC +/- 10 % regulated
Power Consumption:	150 mA maximum
Operating Environment	
Temperature:	-20 to + 50℃
Humidity:	20 - 80% non-condensing
Storage Conditions	
Temperature:	-40 to + 85℃
Humidity:	10 - 95%
Operating frequency:	13.56 MHz
Protocol:	Mifare 13.56 MHz
Transmission range:	5 to 15 mm
Number of write cycles:	>15,000
Communication protocol	Compliant with ISO 14443A
Communication interface:	UART, TTL levels
Data rate:	9600 bps, 8 bits, 1 stop, no parity
Maxim number of simultaneous modules[1]	48

[1] Number of modules in the same host and being active together at the same time

3 SYSTEM DESCRIPTION

The hardware is a small PCB which has the following parts:

- RFID antenna coil on the PCB
- RFID chip
- Slave PIC processor for interfacing between the UART commands and the RFID chip
- Red and green LEDs that can be arbitrarily controlled via UART
- Micro-switch that can be read via UART

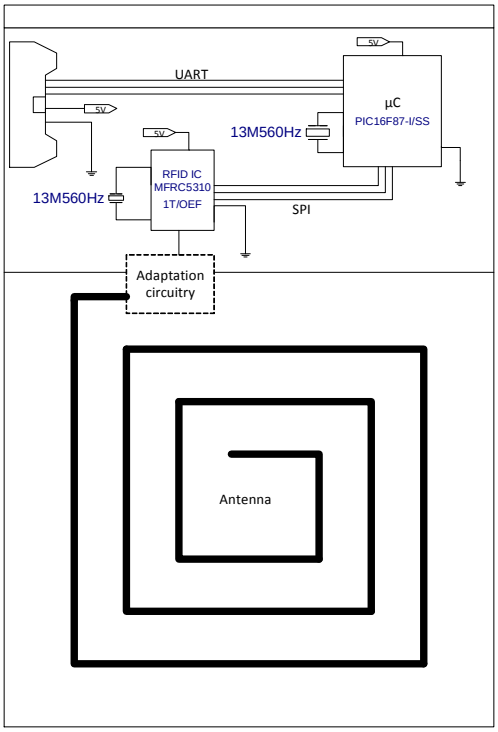
On the back of the RFID board there is a push-button micro-switch that is connected to two spare inputs on the slave processor (RA2 and RA3). This can be read via the UART communication.

3.1 Electrical Interface

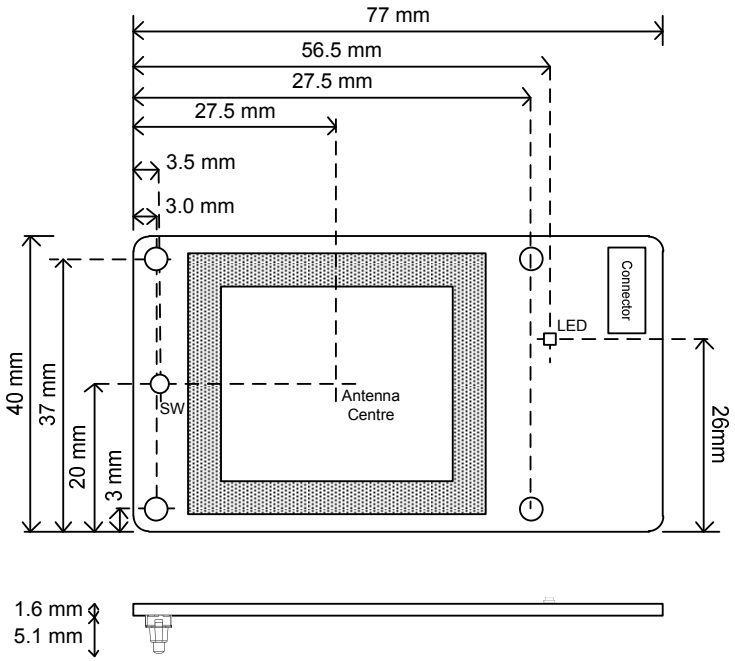
The RFID connector is a 6-pin Molex PicoFlex 90814-0006.

Pin	Function
1	5V
2	Ground
3	Data out of master to RFID
4	Data out of RFID to master
5	RFID CTS to master
6	Not connected

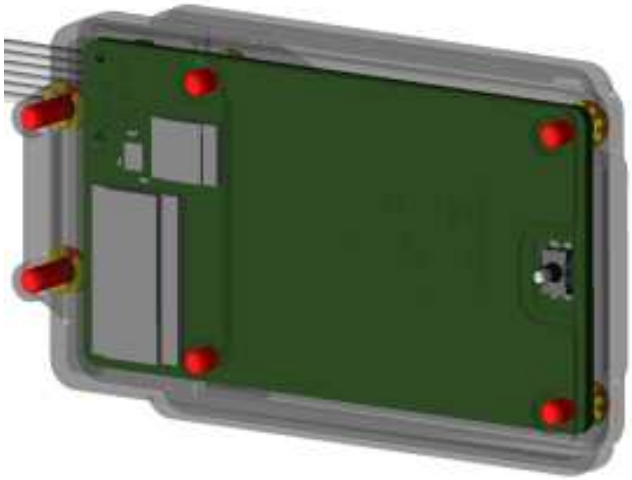
3.2 Block Diagram



3.3 Mechanical Drawing



With its plastic enclosure:



4 INSTALLATION PROCEDURE

4.1 Installation Requirements

In order to reduce unwanted emission in the spurious domain under the maximum regulatory limits, two ferrites must be added on the cable connecting the RFID board to the instrument at a distance of 70 mm maximum from the RFID board connector. The ferrites are mounted as described:

- One ferrite on the power supply wires
- One ferrite on the data and switch wires
- Wires must make a loop one time through the ferrite
- Ferrites must be Würth Elektronik P/N 7427114

4.2 Installation

Install the board with screws using the four holes. The PCB should be covered by an RF permissive material cover (e.g. plastic).

Power the board with a regulated 5 VDC power supply.

4.3 Command set

The command set is described in the MFPROT_LP.pdf document that can be downloaded from http://www.ibtechnology.co.uk/pdf/MFprot_LP.PDF. Please refer to this document to control the board.

5 TROUBLESHOOTING

5.1 Error Messages

Error Message	Probable Cause(s)
LED doesn't light up	Check the presence of 5VDC between pin 1 and 2 of the connector
The board doesn't respond to UART	Check the host baud rate
RFID Tag cannot be red	Check the tag type and distance to the reader