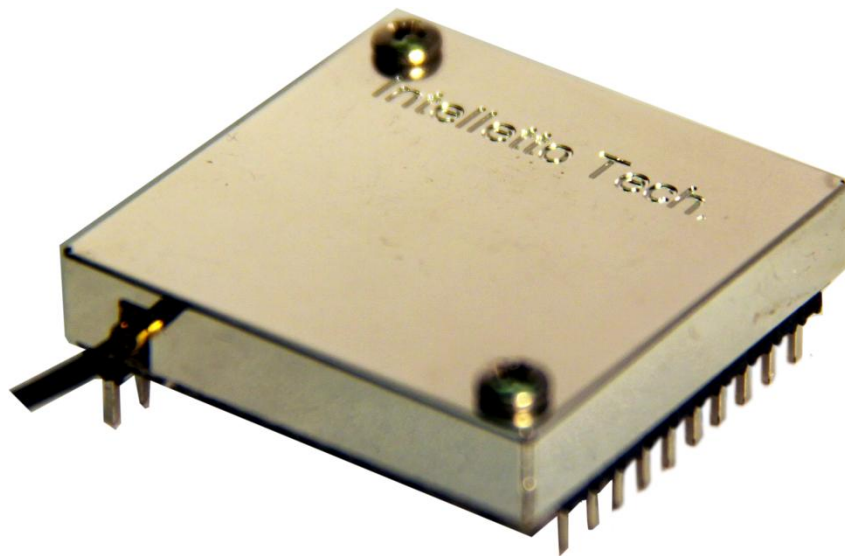




MHF1 User Manual

HF Reader Module



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2 Safety instruction and Warnings

Use this documentation to familiarize yourself with all necessary steps and considerations that must be considered before using this device. This device must strictly be used in accordance with the guidelines explained in this documentation and any changes or use of parts and additional devices which is not recommended by the manufacturer may cause harmful injuries and the manufacturer is not liable for such cases.

Users must consult with the most recent documentation available at the time of purchase. The manufacturer is not responsible for the use of outdated or unsuitable documentation that may lead to incorrect use of the device.

Any modification and/or repairs must be conducted by the manufacturer or its qualified representative.

3 Module Application and Operation Frequency

MHF1 module is a RFID-reader module designed for the purpose of reading and encoding passive RFID-tags. MHF1 Module operates at 13.56 MHz and is suitable for applications that require RFID read and write in a short to medium range and can be installed as an embedded module in other devices in combination with a certified antenna. MHF1 Module is encapsulated in an RF shielding that inhibits EM interference.

4 Reader Module and Accessories

Table 1

Type	Model Number	Description
Reader Module	MHF1	Antenna: external Antenna connector: U.FL and Separate 2 pole Connector Supply: 5 V DC RF shielding: Metal cap I/O: 4 Digital inputs/outputs Serial Interface: TTL Compatible
Antenna	ANTH100-BL	Desktop Antenna
Antenna	ANTH2	Embedded Antenna
Antenna	ANTH-SP1	Embedded Antenna

5 Physical characteristics

Following figure 1 shows the physical dimensions for the MHF1 Module.

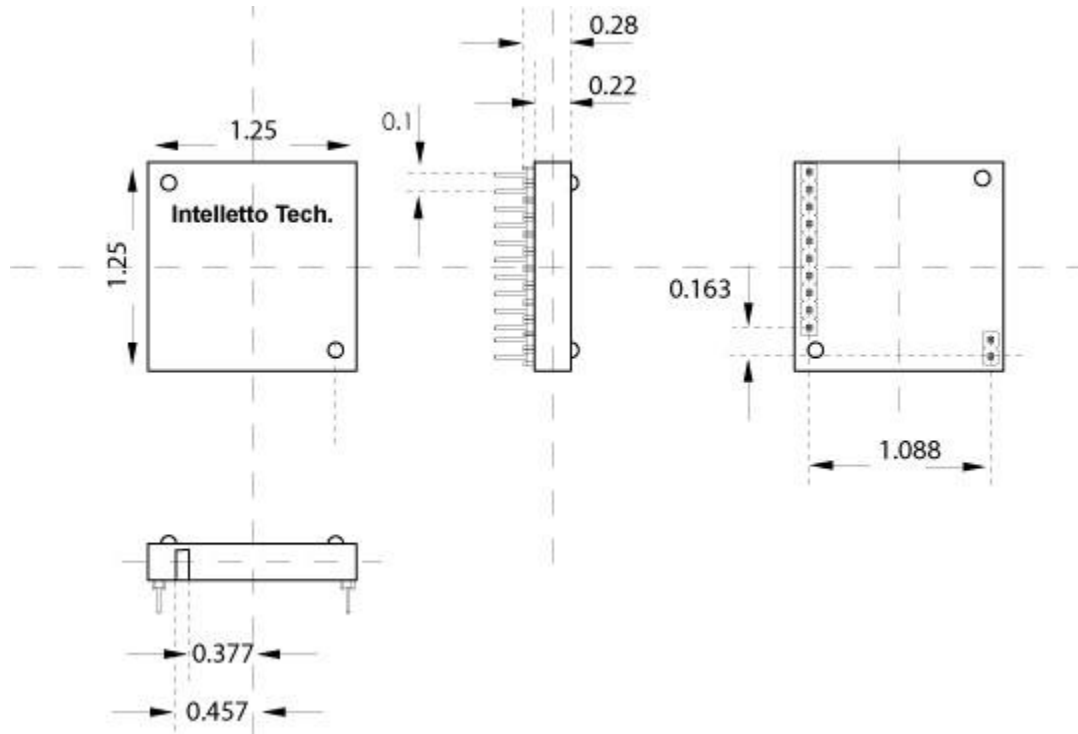


Figure 1

6 Terminal Connections

Figure 2 shows the pin assignment for terminal connections J1 and J2. Both terminals are designed to be used with 0.1" (2.54mm) socket connector or alternatively soldered directly to a PCB with proper footprint. Application of each pin is defined in table 1 and 2.

External approved antennas can be used with MHF1 module through a 50 Ω coaxial cable connected to RF receptacle Conn1. Conn1 is an ultra miniature RF connector installed on the PCB under EMI shielding cap. Please see the antenna connection section of this manual for more information on approved antennas and connection to Conn1.

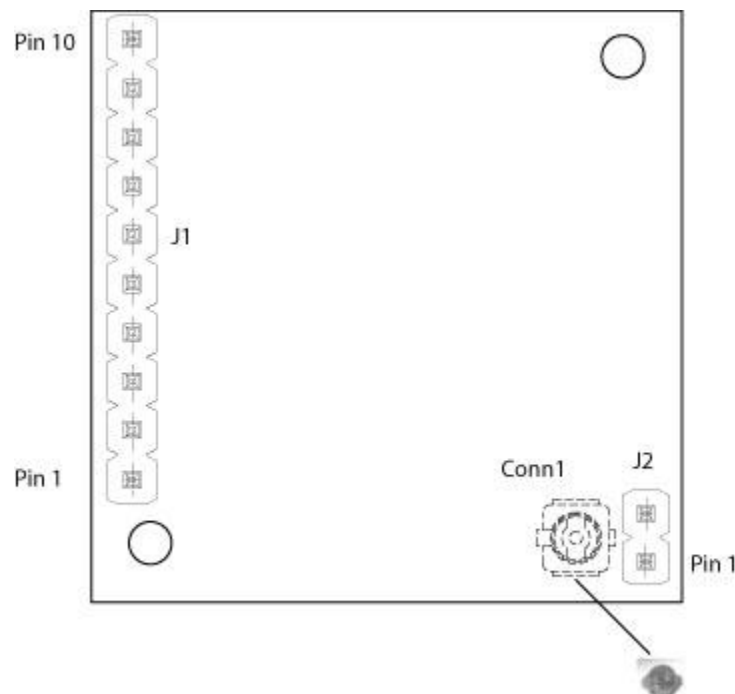


Figure 2

Table 2

J1 Pin No.	Application	Description
1	Digital I/O 1	First digital input/output
2	Digital I/O 2	Second digital input/output
3	Digital I/O 3	Third digital input/output
4	Digital I/O 4	Forth digital input/output
5	Reset	Resets the module, active low input
6	TXD	Transmit data, TTL level compatible
7	RXD	Receive data, TTL level compatible
8	Wakeup	Wakes the module up from sleep, active low input
9	VCC	+5 Volt DC
10	GND	Ground

Table 3

J2 Pin No.	Application	Description
1	GND	Ground
2	Signal	To be connected to external 50Ω antenna

Table 4

Conn1	Application	Description
Shield	GND	Ground
Center Pin	Signal	Connects to U.FL plug connector for connecting to an external 50Ω antenna with a 50Ω coaxial cable.

7 Supply voltage requirements

MHF1 accepts regulated +5 Volts with tolerance of 5% to be supplied through pin 9 of the Header J1. Battery input or linear regulators are recommended.

In case of using other type of supply such as switching regulators user must ensure minimum ripple by applying adequate filtering to ensure a clean supply to MHF1 module. Dirty supply to the module may reduce the read and write functionalities.

MHF1 module does not have any protection for reverse polarity. Wrong connection to power supply may permanently damage the module.

8 Connection to a MCU

MHF1 module can be connected to an external microcontroller directly. Standards communication setting are defined in table 5 but can be changed through software settings.

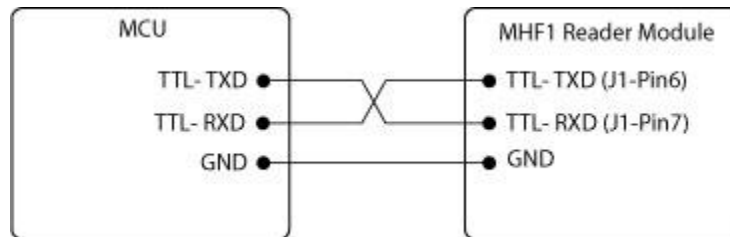


Figure 3

Table 5

Parameter	Standard Setting
Bit Per Second (Baud Rate)	38400
Data Bits	8
Parity	None
Stop Bits	1

9 Antenna Connection

Following explains available antennas and connection type to MHF1 Module.

9.1 Desktop Antenna

ANTH100-BL is a desktop antenna (Figure 4) approved to be used with MHF1 module. ANTH100-BL is designed with a RP SMA Plug connector. See table 6 for the matching cable type to be used with this antenna.



Figure 4

9.2 Embedded Antenna

ANTH2 is a small antenna designed for embedded application (Figure 5) approved to be used with MHF1 module. Connector type on this antenna is an ultra miniature (U.FL) jack. See table 6 for the matching cable type to be used with this antenna.

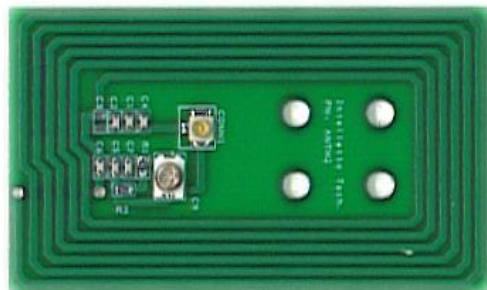




Figure 5

9.3 Embedded Antenna ANTH-SP1

ANTH-SP1 is a medium size antenna designed for embedded applications approved to be used with MHF1 module. This antenna is not available for resale as an individual item but it is being used in other products available from the manufacturer.

Table 6

Coaxial Cable	Application	Picture
Ultra miniature R/A plug to RP SMA jack	To connect MHF1 module to antenna with RP SMA plug connector	
Ultra miniature plug to Ultra miniature plug	To connect MHF1 module to antenna with U.FL jack Connector	

9.4 Antenna Connector on MHF1

MHF1 is designed to connect to one external antenna using connectors CONN1 or J2. Both connectors are connected internally therefore the user may use either of them, but not both at the same time. CONN1 is an ultra miniature RF connector to be used with 50Ω matching plug and coaxial cable. J2 is a 2 pin 0.1” header connector to be used in embedded applications. J2 connector is mounted on the back of the module and it is visible. CONN1 on the hand is not visible and EMI shielding must be removed temporarily to connect to this connector.

Figure 6 shows MHF1 module without shielding. Placement of CONN1 is marked on Figure 6 where it shows MHF1 module without EMI shielding.

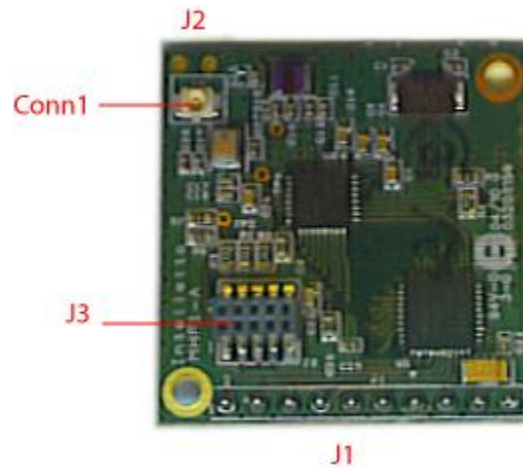


Figure 6

10 Using Digital Input and Outputs

MHF1 is designed to have four bidirectional digital I/O lines. Default setting of each I/O line is to be an output. Absolute maximum on each I/O lines is 3.3 Volts and 6 milliamp sink or source. For example any of four I/O lines can be configured to light up an LED when a RFID tag is intercepted by the module, see Figure 7. Please note special test firmware must be loaded before using the module in standalone tag sense mode.

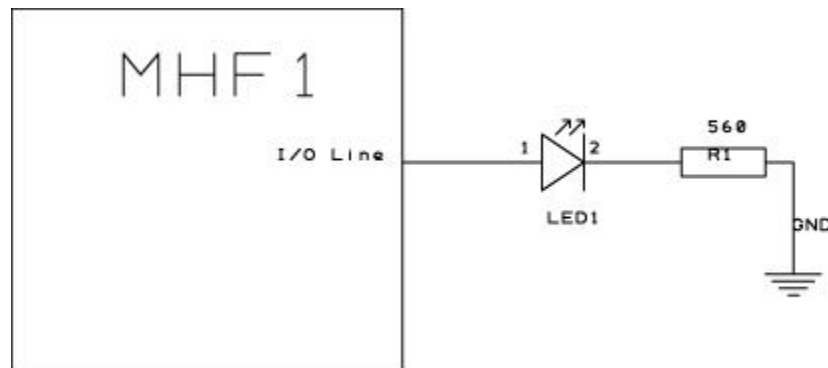


Figure 7

11 Firmware upgrade

Firmware on MHF1 module can be updated through J3, depicted in figure 6. Special tool and cable is required to update the module with new firmware.

12 Approvals

12.1 Approval for United States of America, FCC

FCC ID: X7X-MHF1

This device 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.

NOTICE:

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment."

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 or more 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.

Approved Antennas

This device is labeled with FCC ID number and the antennas listed below are the only antennas approved to be used with this device.

1. ANTH100-BL
2. ANTH2
3. ANTH-SP1

12.2 FCC RF Exposure Compliance

IMPORTANT:

This module complies with FCC RF exposure requirement as per Section 2.1093 & 1.1307(b)(1). In order to satisfy FCC RF exposure requirements for the final product, this module must not exceed the maximum radiated power measured as shown in the filing and must be used with the three antennas that have been tested and approved for use. This modular transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

12.3 Approval for Industry Canada, IC

IC: 8859A-MHF1

This device complies with Industry Canada emission requirement and bears the ID on the module to indicate the compliance.

12.4 Labeling

Each device bears a sticker showing both **FCC** and **IC** numbers visibility on the EMI shielding. See Figure 8 for a sample sticker.



Figure 8

12.5 Use of Module in an End Device

If an end device containing a MHF1 Module will be sold or used in USA or Canada, the enclosure of the product must display a label with the basic elements and wording depicted in Figure 9. Further the end device must comply with requirement of FCC part 15 and requirements for unintentional radiation.

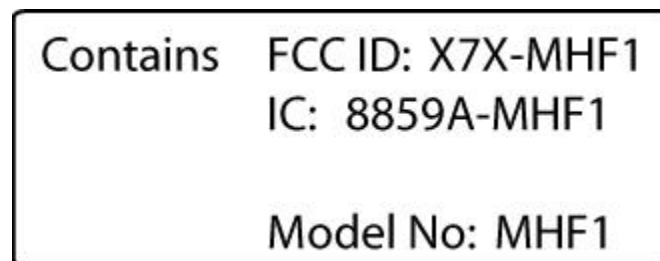


Figure 9

IMPORTANT:

Final product must comply with unintentional radiators (FCC section 15.107 & 15.109) before final product declared compliant with part 15 of FCC rules.

13 Technical Data

MHF1 Reader Module and Accessories	
Dimensions with shielding	1.25" x 1.25" x 1.28" (L x W x H)
Data Connector	10 Pin 0.1" Connector
Supply Voltage	5 V DC \pm 5%
Max Current	40 mA
Operating Frequency	13.56 MHz
Antenna Connector	U.FL and 2 Pin 0.1" Header
Data Interface	TTL
Flash Memory	32 Kbyte
RAM	2 K Byte
Tag Protocols	ISO 15693 ISO 14443A/B HF EPC (available with special FW) Tag-it FeliCa (available with special FW)
I/O Lines	4 Digital input/outputs
Emission Approvals	FCC 47 CFR Part 15 Industry Canada
Accessories	Antenna: Desktop ANTH100-BL Antenna: Embedded ANTH2