Data Sheet

Approvals_1356.pdf

4 Pages
Last Revised 05/02/06

MicroRWD (13.56MHz) EC and FCC Directive Conformity

Background

MicroRWD MIFARE / ICODE RFID reader device is a fully integrated 13.56MHz read/write solution for Philips Semiconductors Mifare 1k/4k, Ultralight and ICODE SLI passive RF transponders. It is completely housed in a 24-pin DIP package and only requires an external 1 micro Henry antenna coil, tuning capacitor components and a 5v DC supply to be a fully featured "system on a chip". The MicroRWD device incorporates a TTL level RS232 serial interface for host communication and a number of input and output pins for reading switch inputs, driving indicator LED's and other output devices such as relays etc. These output lines can also be used to accommodate additional host interfaces such as Weigand, clock/data and other data output protocols. The MicroRWD can be used in a standalone mode using its internal EEPROM for validating transponder serial numbers or can be connected to a host computer or microcontroller using the 9600/38400-baud serial interface.

Transponders

Mifare 1k/4k, Ultralight and ICODE SLI passive RF transponders are read/write memory and logic IC devices that are connected to a small antenna coil. This coil and tuning capacitor components on the transponder chip itself form a passive 13.56MHz resonant circuit.

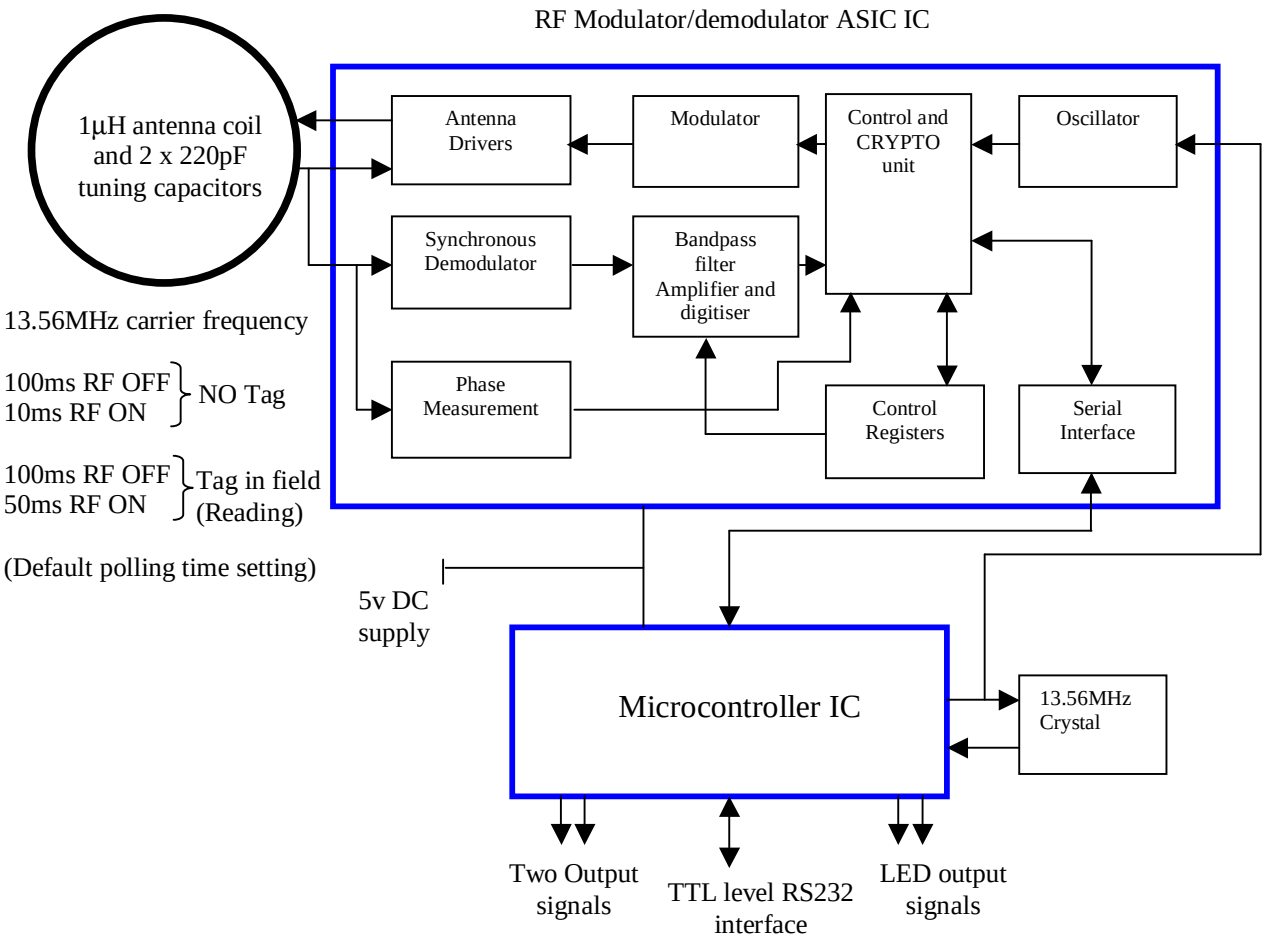
The assembly is then packaged as a sealed "Tag" or ISO smart card. They derive all their power from the 13.56MHz RF field generated by the MicroRWD reader module. The packaged tags or smart cards interpret commands passed over the RF carrier frequency and modulate this field to pass data back to the reader. The method of operation and modulation schemes are defined in the ISO 14443A and ISO 15693 standards.

MicroRWD circuit description

The MicroRWD module is made up of an RF ASIC IC (modulator/demodulator), a microcontroller IC and a number of R, C and L passive components, all of which are powered from an external 5-volt DC supply. A single 13.56MHz crystal provides the oscillator-clocking signal for both ICs. The RF ASIC generates the 13.56MHz carrier frequency, which under control of the microcontroller is turned ON and OFF according to a polling duty cycle. (Default setting – 100ms OFF / 10ms ON with no tag in field and 100ms OFF / 50ms ON reading a tag in field). Because the RF field is normally turned off and is effectively only on for short periods of transponder communication, the average power consumption of the MicroRWD is very low compared to other products on the market
The 13.56MHz carrier frequency drives a pair of FET transistors, which are connected, to an antenna coil of around 1µH inductance (typically a simple 6-7cm diameter wire wound coil or PCB track antenna) with associated 220pF tuning capacitors. Under optimum conditions this

forms a resonant circuit at the 13.56MHz fundamental frequency and 60v peak-to-peak and 150ma peak currents are created in the coil. This radiated carrier field has sufficient strength to power passive transponders in close proximity (5-10cm max range typically).

MicroRWD simplified Block Diagram



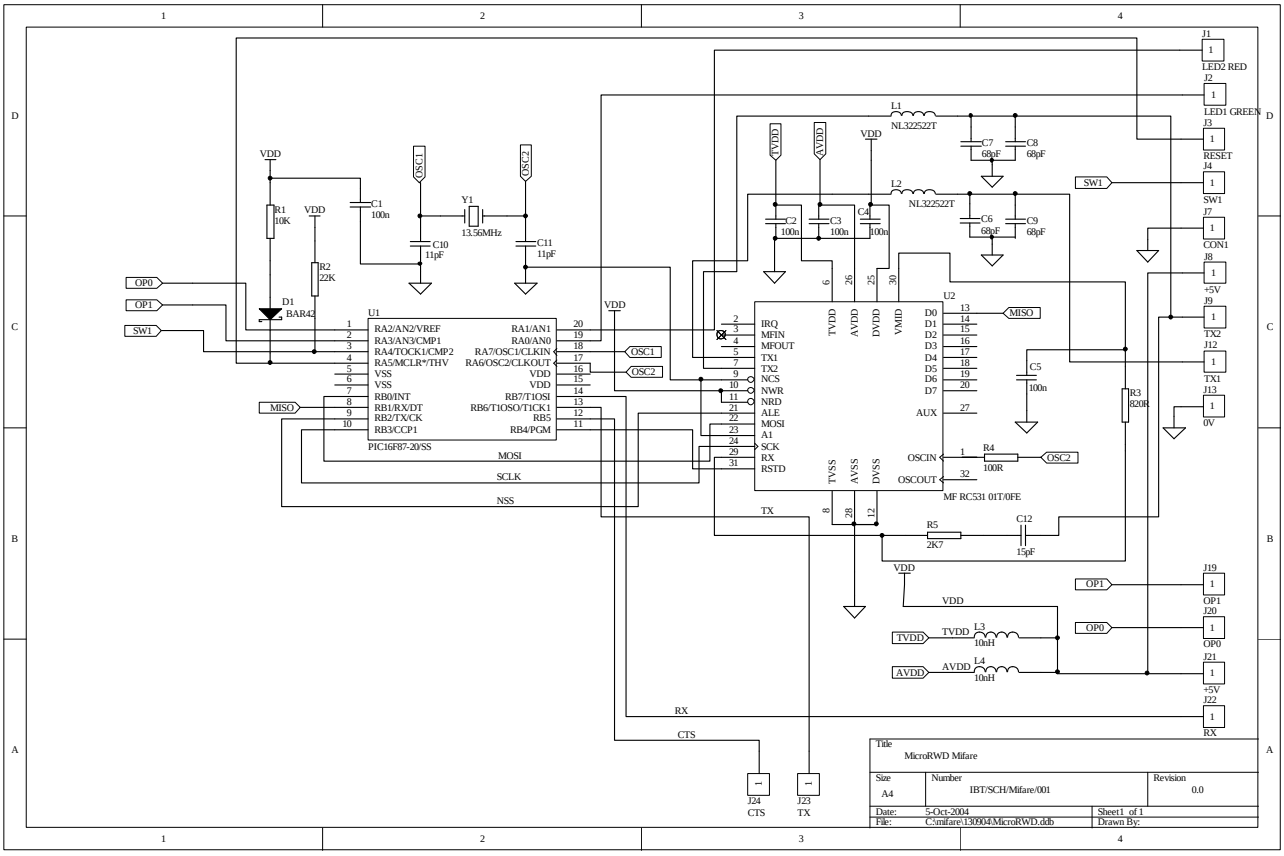
Typical operation for MicroRWD MIFARE version is as follows:

The MIFARE transponder also has a small antenna coil and capacitor, which is designed to resonate at 13.56MHz so that when the MicroRWD reader field is turned on they form an inductive link (like an air-cored transformer). The transponder antenna picks up the carrier signal and rectifies it internally to provide sufficient power for its logic and memory to wake-up. Communication is half duplex at a basic rate of 106 kbaud (9.44 us bit frame period) in both directions. MicroRWD Reader communicates with the transponder using 100% ASK pulse-pause (Miller Code) modulation according to ISO14443 Type A protocol. Transponder communicates back to reader using Manchester Coded sub-carrier load modulation at 847.5 kHz (13.56MHz/16) sub-carrier frequency.

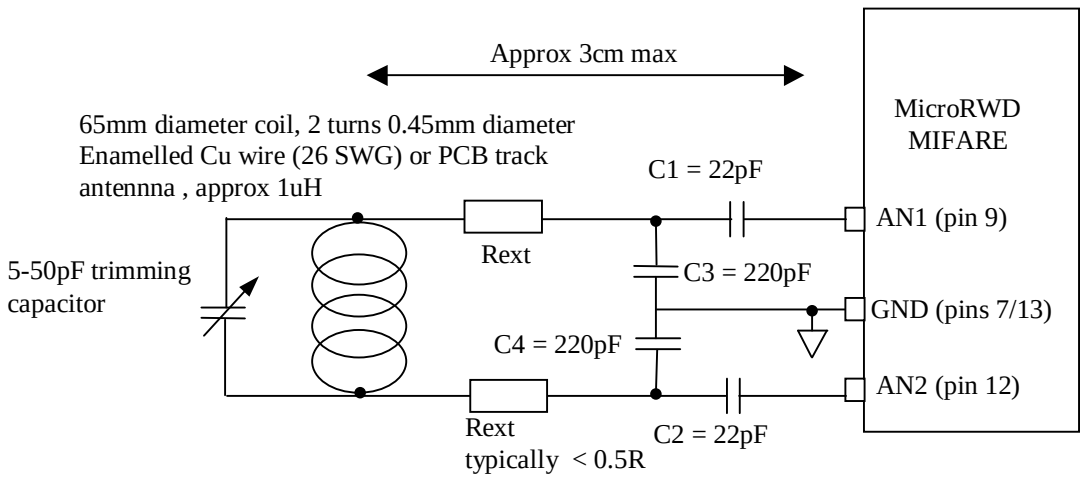
After filtering and demodulation, the microcontroller processes the Manchester Coded bit stream and decrypts/decodes the information further before providing the data in a convenient high-level form on it's TTL level RS232 interface.

The microcontroller also has two I/O lines that can supply up to 25ma sink current to drive external loads. Two I/O lines are also specifically allocated to drive Red and Green LEDS to give visual indication of valid card in the field etc.

MicroRWD MIFARE module circuit diagram



Recommended Antenna circuit



Typical Characteristics:

Supply VDD: 5v (+/- 10%). Carrier frequency: 13.56MHz.
RF OFF/ON duty cycle 100ms:10ms (no tag in field), 100ms/50ms (reading tag data)

Max antenna voltage (optimum conditions): 60v peak-to-peak at carrier frequency
Max antenna current (optimum conditions): 150ma peak

Transponder data rate: 106 kbaud Manchester coded

Forward-modulation: 100% ASK pulse-pause (Miller Code) modulation
Back-modulation: Sub-carrier load modulation at 847.5 kHz (13.56MHz/16) frequency.

Serial interface: TTL level RS232. 9600/38400 baud, 8 bits, 1 stop, no parity, CTS Handshaking.

Approvals

As a low power active transmission device in the 13.56MHz ISM frequency band the MicroRWD has been designed to conform to the European Community R&TTE (Radio and Telecommunication Terminal Equipment) Directive (99/5/EC) and specifically EN 300 330. Ultimately the conformity would depend on the user following the design guidelines provide by IB Technology with regard to designing the antenna coil and associated circuitry.

The final application or product would also have to comply with EMC (Electro Magnetic Compatibility) Directive (89/336/EEC) and its various amendments encompassing the CE Marking directive. In particular EN 300 683 (EN 61000-4-2 / 3) covers Electrostatic Discharge susceptibility and RF Electromagnetic Field immunity. IB Technology provides application notes and reference schematics to indicate how the MicroRWD should be used to ensure the final product compliance. It is the responsibility of the end user to ensure the power supply and surrounding circuitry complies with this EMC Directive. With regard to the US FCC regulations, FCC Rules Part 15 covers the MicroRWD product and testing to the EC directives described above would provide sufficient data for US compliance.

Typical End Product Test Requirements:

ETS 300 330: EU harmonised standard for low power transmitters. Conducted / Radiated RF Power, Frequency Stability, Adjacent Channel / Spectrum mask. Conducted / Radiated Spurious Emissions, Temperature –20 to +55 deg C.
ETS 300 683 (EN 61000-4-2, EN 61000-4-3): EMC (UKAS) testing. Radiated Immunity, Electrostatic Discharge.

More information on the Micro RWD and other products can be found at the Internet web site:

http://www.ibtechnology.co.uk

Or alternatively contact IB Technology by email at:

sales@ibtechnology.co.uk