Data Sheet

Approvals.pdf

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MicroRWD EC and FCC Directive Conformity

Background

MicroRWD RFID reader device is a fully integrated 125 kHz read/write solution for Philips Semiconductors Hitag, EM Marin and Microchip RF passive transponders. It is completely housed in a 24-pin DIP package and only requires a 700 micro Henry antenna coil connected and 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 Wiegand and clock/data 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-baud serial interface.

Transponders

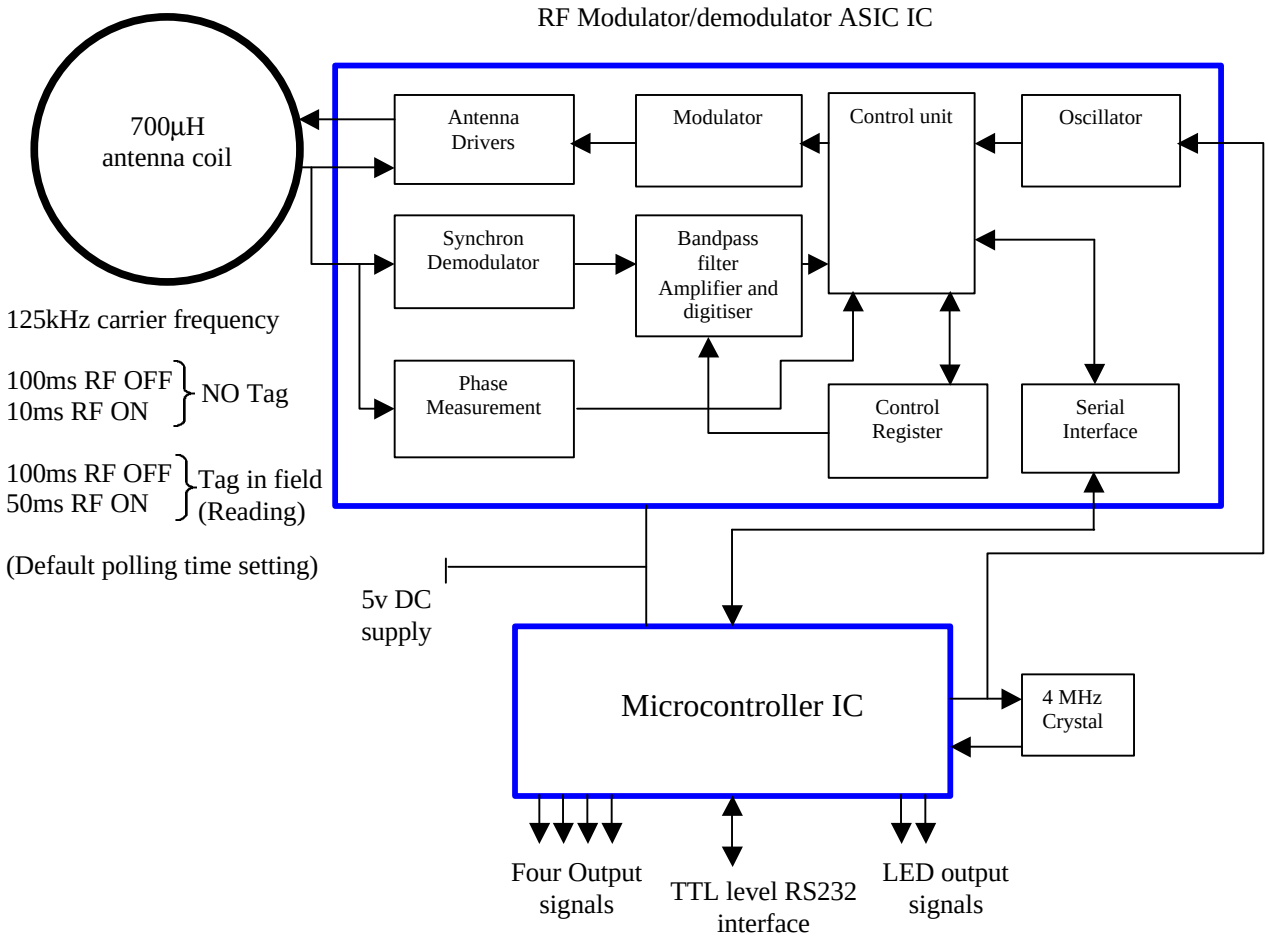
Hitag 1, Hitag 2, EM Marin H400X and Microchip MCRF200 passive RF transponders are read/write or read only memory devices that derive their power and communicate using a modulated 125 kHz RF field created by the MicroRWD antenna coil. They can use various communication schemes and have different amounts of available memory for storing user information etc. Some of the transponders also use encryption and password authentication techniques to provide communication and data security. The transponders or tags can be packaged in a variety of forms but essentially all consist of the transponder device connected to a coil of the appropriate inductance.

MicroRWD circuit description

The MicroRWD module is made up of an RF ASIC IC (modulator/demodulator), a microcontroller IC and a number of R and C passive components, all of which are powered from an external 5-volt DC supply. A single 4 MHz crystal provides the oscillator-clocking signal for both ICs. The RF ASIC internally divides this to produce the 125kHz 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 125kHz carrier frequency drives a pair of FET transistors, which are connected, to an antenna coil of 700µH inductance (typically a simple 7-10cm diameter wire wound coil) with a 2nF capacitor in series. Under optimum conditions this forms a resonant circuit at the 125kHz fundamental frequency and 100v peak-to-peak and 200ma peak currents are created in the coil. This radiated carrier field has sufficient strength to power passive transponders in close proximity (up to 15cm max range typically).

MicroRWD Block Diagram



Typical operation for MicroRWD H400X version (read-only type) is as follows:

The H4001 transponder also has a small antenna coil and capacitor which is designed to resonate at 125kHz 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 it's logic and memory to wake-up. The 64-bit content of the internal memory is encoded into a Manchester code bit stream that is used to "Amplitude Modulate" (ASK) the received carrier frequency at a rate of RF/64 (2 kbaud). Using the inductive coupling principle, the MicroRWD reader antenna picks up this modulation. MicroRWD antenna signal levels for a transponder in close proximity to the antenna are typically less than 100mv ASK modulation on the 100v peak-to-peak carrier. The RF ASIC device demodulates the data and corrects for phase shift. Finally the microcontroller reads the Manchester bit stream, decodes it further and checks for parity and other data errors before providing the data in a convenient protocol form on it's TTL level RS232 interface.

The microcontroller also has four 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.

Typical Characteristics:

Supply VDD: 5v (+/- 10%)
Carrier frequency: 125kHz
RF OFF/ON duty cycle 100ms:10ms (no tag in field), 100ms/50ms (reading tag data)
Max antenna voltage (optimum conditions) 100v peak-to-peak at carrier frequency
Max antenna current (optimum conditions) 200ma peak
Transponder data rate: 2k baud (RF/64) Manchester coded
Back-modulation: ASK
Serial interface: TTL level RS232. 9600 baud, 8 bits, 1 stop, no parity, CTS handshaking

Approvals

As a low power active transmission device in the 125 kHz 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. The frequency band below 135 kHz is license free and as such represents a straightforward approval path. 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.

No responsibility is taken for the method of integration or final use of Micro RWD

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:

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