Operational Description

Wallterminal WT2000 ISO Tagit

The Wallterminal WT2000 consists of the two components control unit and reader unit.
The control unit is usually mounted in a save area inside the building, maybe at an electrical control cabinet. The reader unit is connected to the reader unit using a normal four-pole cable and is mounted outside the building, maybe beside the door.

The control unit controls the reader unit using a RS485 interface. All inputs and outputs are on the control unit.
The reader unit only sets the two status LEDs and controls the transponder interface. All transponder datas are transmitted directly to the control unit for interpretation.

The RFID circuit at the reader unit is based on the Texas Instruments S6700 Multi Protocol Transceiver IC RI-R6C-001A.
Please see the attached data sheets for details.

TEXAS INSTRUMENTS

HF Reader System Series 6000

S6700 Multi Protocol Transceiver IC

RI-R6C-001A

Reference Guide

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TI-RFid

A TEXAS INSTRUMENTS TECHNOLOGY

1.1 General

This document provides information about the S6700 Multi Protocol Transceiver IC. It describes the integrated circuit and how to implement it.

1.2 System Description

The HF Reader System Series 6000 works at a frequency of 13.56 MHz. It comprises a reader, antenna and transponder (for example: smart label) and is used for wireless identification.

The system works according the “reader talks first” principle which means that the transponder keeps quiet until the reader sends a request to it. The reader can rapidly and simultaneously identify numerous transponders in the antenna’s field. It can write data to and read data from the transponders; either in addressed mode by using the factory programmed read only number, or in general mode to all of the transponders in its field. The read/write capability of the transponder allows users to update the data stored in the transponders memory anywhere along its movements.

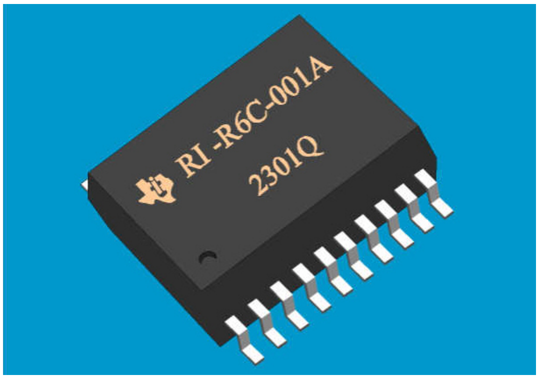
1.3 Product Description

The S6700 Multi Protocol Transceiver IC opens a rapid path for the development of a broad range of 13.56 MHz RFID readers. It provides the receive/transmit functions required to communicate with a variety of transponders that operate in the 13.56 MHz ISM band. A transmit encoder converts the transmitted data stream into the selected protocol; protocol selection is done in the header of the transmitted data string. The transmitter can provide up to 200 mW of RF power to a matched 50 Ω load with a 5 V power supply. Higher output power can be obtained by an external amplifier.

The receive decoder converts the signals from the RF receiver into a simple data string.

The digital interface provides on-chip data encoding and recovery, thereby minimizing the software design efforts for the end user. Communication with the circuit is achieved by means of a three wire serial link.

Figure 1: S6700 Multi Protocol Transceiver IC (RI-R6C-001A)



1.4 Communications Protocols

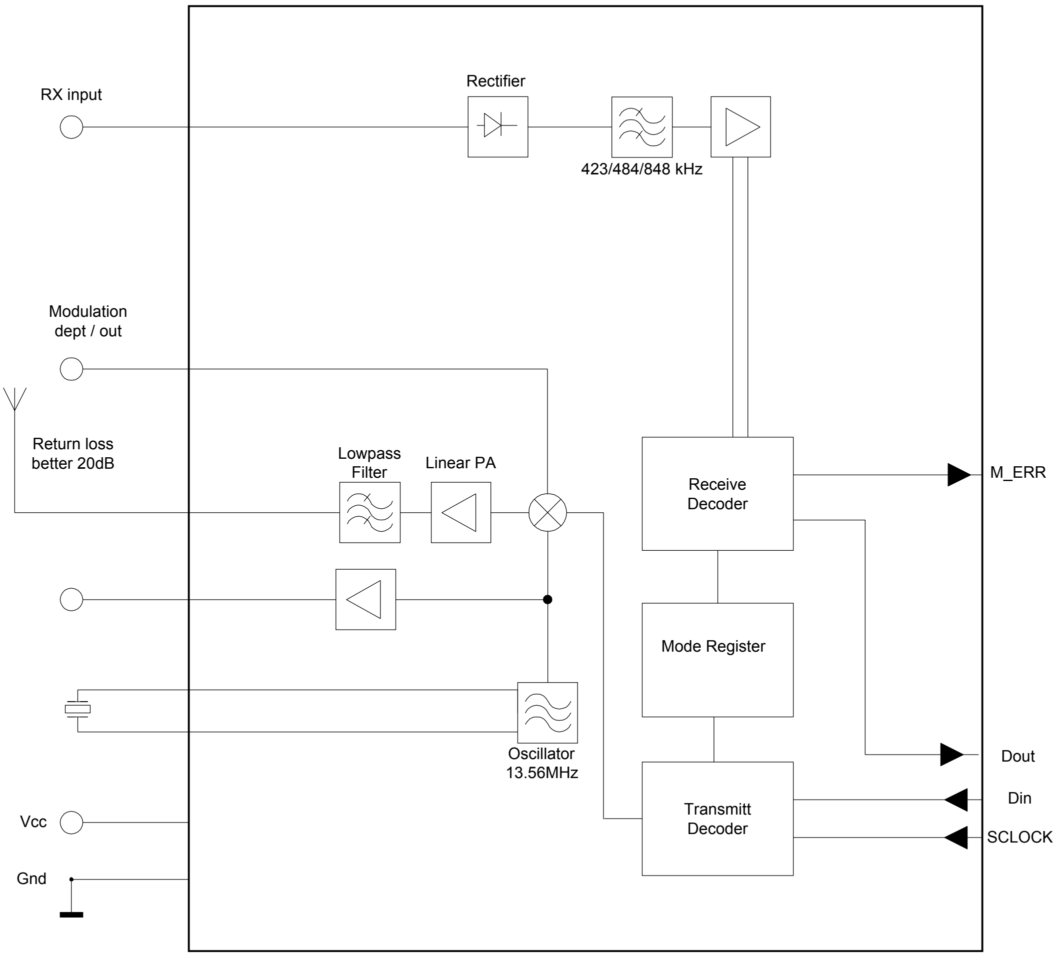
The Transceiver IC can handle different RF protocols as follows:

1. Tag-it protocol.
2. ISO / IEC 15693-2 [2].
3. ISO / IEC 14443-2 (Type A).
4. Direct mode where data can be passed directly thru to a transponder; using the correct modulation, timing, and command structure.

2.1 Functional Description

A simplified block diagram of the Transceiver IC is shown in Figure 4, the different electronic parts of the IC are described in sections 2.1.1 to 2.1.6.

Figure 4: Simplified Block Diagram



2.1.1 Power Supply

The Transceiver IC requires a nominal 5 volts external power supply. Operation is guaranteed between 3 Volts and 5.5 Volts. The current drain depends on the antenna impedance and the output matching network configuration. We strongly recommended that you use a well regulated supply as power supply ripple and noise will severely degrade the overall system performance.

2.1.2 Transmitter

The output transistor is a low Ron MOSFET. The drain is directly accessible on the TX_OUT pin. A recommended application schematic optimized to drive a resistive fifty ohms antenna with a five volts power supply is shown in Appendix A. A simple resonant circuit or/and a simple matching network can be connected to the output to reduce harmonic suppression and enhance the general performance.

100% modulation is achieved by means of gating the square wave drive of the output transistor.

The ten percent modulation depth is obtained by means of switching a resistor in series with the output transistor source connection. Increasing the value of this resistor further increases the modulation depth.

The transmit encoder converts the data into the selected RF Protocol to be transferred. The communications speed varies from 5 to 120 kbaud and must be at least the speed of the selected transponder protocol. An input buffer is implemented in order to have a sufficient number of bits available for the RF transmission.

2.1.3 Receiver

The receiver input is typically connected to the antenna through an external resistor. The modulation from the tag is then recovered by means of a diode envelope detector.

The receiver decoder issues the received data directly to the controller in binary data format. The communication speed and RF protocol is defined by the selected mode. Start, stop and errors in the received data string are detected and indicated at the output.

2.1.4 Reference Clock and Internal Oscillator

The reference clock can be obtained externally by applying a suitable clock signal to the XTAL2 pin. A sine wave centered at VCC/2 or a CMOS logic compatible signal is an acceptable external system clock. The built-in reference oscillator will work either with a quartz crystal or a ceramic resonator. The nominal system clock frequency is 13.56 MHz, but the oscillator will work at any frequency from 4 MHz to 16 MHz. A buffered version of the crystal oscillator signal is available for synchronization purposes on pin 8 (XTAL_CLOCK).

2.1.5 Reset Defaults and Power Management

After a power on reset has been performed, the device is placed in its default configuration. There are three available power modes. In the first mode, the device is fully powered. In the idle mode, only the reference oscillator and a minimal set of associated circuitry are running. In the power down mode, the device internal bias system is completely switched off. The circuit is woken by applying a rising edge on the DIN line while SCLOCK is held high.

2.1.6 Serial communication interface

The communication interface normally uses three wires:

SCLOCK, serial clock, bi-directional.

DIN, data input, as seen by the circuit

DOUT, data output, as seen by the circuit

The commands are sent with the most significant bit (MSB) in the first position. All signals are internally synchronized with the system clock.

The bit protocol is fully described in Chapter 4.

2.2 Pin Description

Figure 5 shows the Transceiver IC and the signals on each pin. They are further described in Table 1.

Figure 5: Transceiver Pins

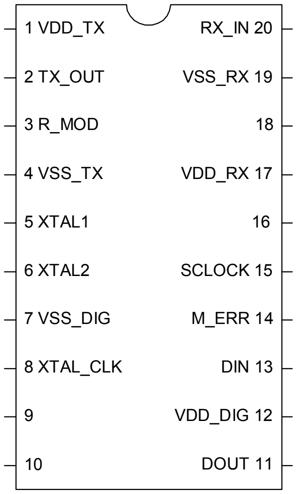


Table 1: List of Connectors

Pin number	Signal Name	Description
1	VDD_TX	Transmitter power supply
2	TX_OUT	Output transistor drain connection
3	R_MOD	External resistor to set 10% modulation depth mode
4	VSS_TX	Transmitter section ground
5	XTAL1	Pin 1 of Xtal resonator
6	XTAL2	Pin 2 of Xtal resonator and external system clock input
7	VSS_DIG	Digital section ground
8	XTAL_CLK	Buffered output of Xtal oscillator
9	not used	Grounded for normal operation
10	not used	Grounded for normal operation
11	DOUT	Data output for serial link
12	VDD_DIG	Digital section power supply
13	DIN	Data input for serial link
14	M_ERR	Manchester Protocol error flag
15	SCLOCK	Serial link clock
16	not used	Leave open for normal operation
17	VDD_RX	Receiver section power supply
18	not used	Leave open for normal operation
19	VSS_RX	Receiver section ground
20	RX_IN	Receiver input