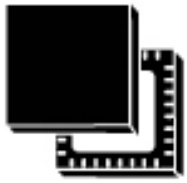
CR95HF

13.56-MHz multi-protocol contactless transceiver IC with SPI and UART serial access

Data brief

Features

- Operating modes supported:
  - Reader/Writer
- Hardware features
  - Dedicated internal frame controller
  - Highly integrated Analog Front End (AFE) for RF communications
  - Transmission and reception modes
  - Optimized power management
  - Tag Detection modes
- RF communication @13.56 MHz
  - ISO/IEC 14443 A and B
  - ISO/IEC 15693
  - ISO/IEC 18092
- Communication interfaces with a Host Controller
  - Serial peripheral interface (SPI) Slave interface
  - Universal asynchronous receiver/transmitter (UART)
- 32-pin VFQFPN (5 x 5 mm) ECOPACK® package



VFQFPN32 5x5 mm

Applications

Typical protocols supported:

- ISO/IEC 14443-3 Type A and B cards and tags
- ISO/IEC 15693 and ISO/IEC 18000-3M1 tags
- NFC forum tag: Types 2, 3 and 4
- ST Dual Interface EEPROM

1 Description

The CR95HF is an integrated transceiver IC for contactless applications.

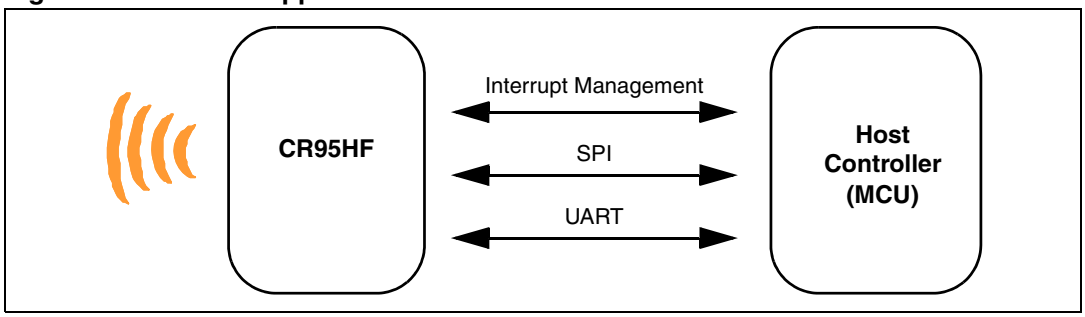
The CR95HF manages the frame coding and decoding in Reader mode for standard applications such as NFC, proximity and vicinity standards.

The CR95HF embeds the Analog Front End for 13.56 MHz Air Interface.

The CR95HF supports ISO/IEC 14443 A and B, ISO/IEC 15693 (single or double subcarrier) and ISO/IEC 18092 protocols.

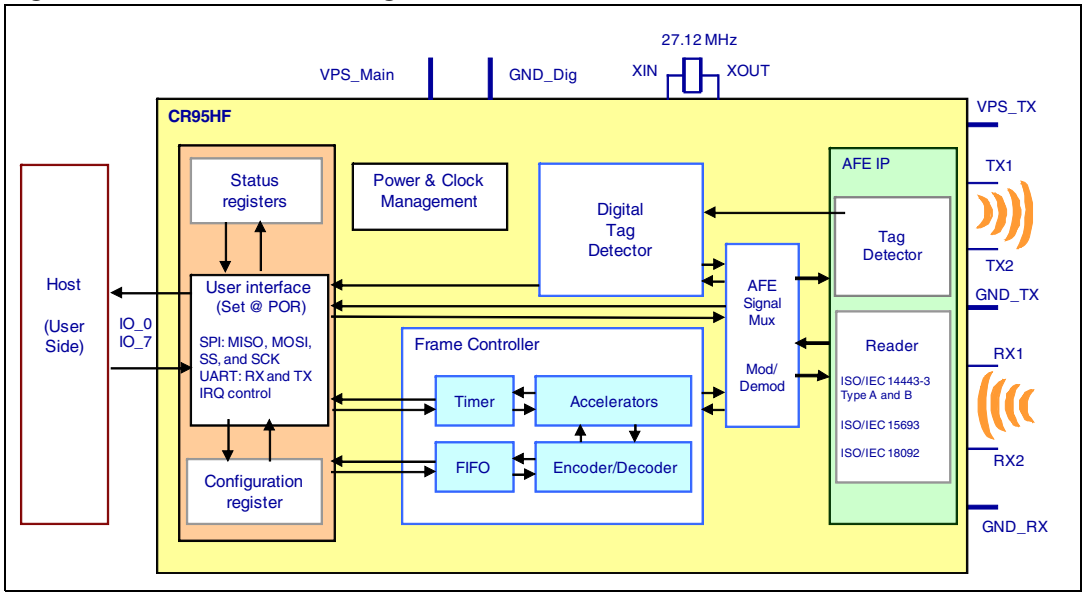
In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK® packages, depending on their level of environmental compliance. ECOPACK® specifications, grade definitions and product status are available at: *www.st.com*. ECOPACK® is an ST trademark.

Figure 1. CR95HF application overview



1.1 Block diagram

Figure 2. CR95HF block diagram



2 Commands

2.1 Command format

Fields <Cmd>, <RespCode> and <Len> are always 1 byte long. <Data> can be from 0 to 255 bytes.

- Direction: MCU to CR95HF

  `<CMD><Len><Data>`

- Direction: CR95HF to MCU

  `<RespCode><Len><Data>`

Note: EchoCode is an exception as it has only one byte (0x55).

2.2 List of commands

Table 1 lists the command set available for standard use.

Table 1. List of commands

Code	Command	Description
01	IDN	Requests short information about CR95HF and its firmware version.
02	Protocol Select	Select communication protocol and specify some protocol-related parameters.
04	SendRecv	Sends data using previously selected protocol and receives the tag response.
07	Idle	Switches the CR95HF into TagDetect or Hibernate state and specifies under which condition to exit from these states.
08	RdReg	Reads wakeup flags.
0A	BaudRate	Sets UART baud rate.
55	EchoCode	Performs a serial interface echo.
Other codes		ST Reserved

3 Power management and operating modes

3.1 Operating modes

The CR95HF has 2 operating modes: Idle and Active. In Active mode, the CR95HF communicates actively with a tag or an external MCU. Idle mode includes two low consumption states: Hibernate and Tag Detector.

The CR95HF can switch from one mode to another.

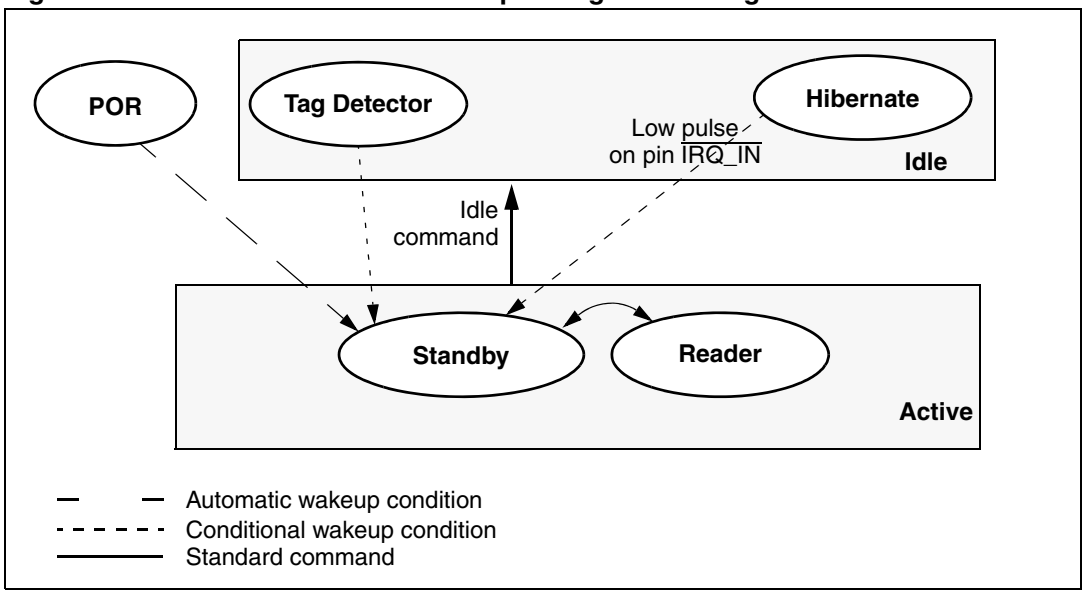
Table 2. Operating modes

Mode	State	Description
Idle	Hibernate	Lowest power consumption. CR95HF has to be waken-up in order to communicate. Low level on $\overline{\text{IRQ\_IN}}$ pin is the only wakeup source.
	Tag Detector	Low power consumption, Tag detection. Wakeup source is configurable: – Timer – $\overline{\text{IRQ\_IN}}$ pin – $\overline{\text{SPI\_SS}}$ pin – Tag detector LFO (low-frequency oscillator) is running in this state.
Active	Standby or Reader	Main communication mode. HFO (high-frequency oscillator) is running, CR95HF is able to decode and execute commands from external MCU. It can switch the reader ON and OFF and communicate with a tag or an external MCU.

Hibernate and Tag-Detector states can only be activated by a command from the external MCU. As soon as Application environmentany of these states are activated, the CR95HF can no longer communicate with the external MCU. It can only be woken up.

The behavior of the CR95HF in 'Tag-Detector' state is defined by the Idle command.

Figure 3. CR95HF initialization and operating state change



4 Electrical characteristics

4.1 Absolute maximum ratings

Table 3. Absolute maximum ratings

Symbol	Parameter	Value	Unit
VPS_Main	Supply voltage	3.3	V
VPS_TX	Supply voltage (RF drivers)	3.3	V
V_{IO}	Input or Output voltage relative to Ground	–0.3 to VPS_Main+0.3	
T_A	Ambient operating temperature	–25 to +85	°C
	Ambient operating temperature (RF mode)	–25 to +85	
T_{STG}	Storage temperature (Please also refer to package specification).	–65 to +150	°C
V_{ESD}	Electrostatic discharge voltage according to JESD22-A114, Human Body Model	2000	V
P_{TOT} (1)	Total power dissipation per package	0.5	W

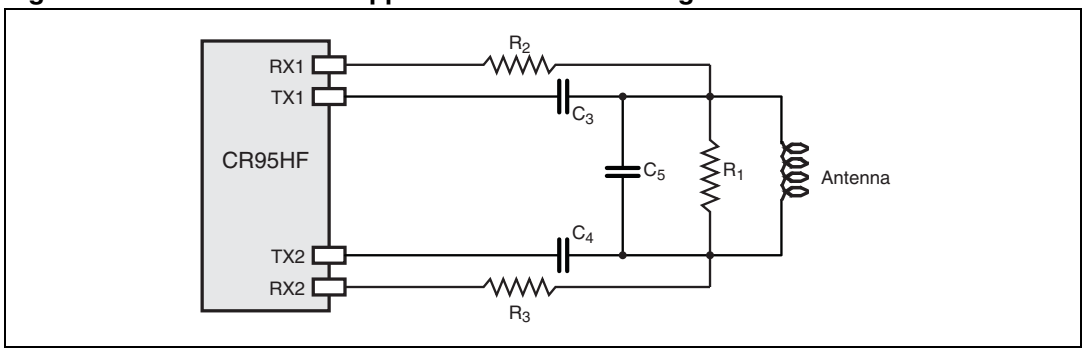
1. Depending on the thermal resistance of package.

Note: Stresses listed above may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operational sections of the specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

5 Application environment

The application environment includes a complete range of hardware and software components from STMicroelectronics and third-party suppliers to demonstrate the efficiency of the CR95HF transceiver and help you to develop and debug your applications and evaluate STMicroelectronics RFID products.

Figure 4. Recommended application schematic diagram



6 Revision history

Table 4. Document revision history

Date	Revision	Changes
03-Feb-2011	1	Initial release.
12-Apr-2011	2	Updated *Figure 1: CR95HF application overview on page 2*, *Table 1: List of commands on page 3* and *Section 3: Power management and operating modes on page 4*.

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