# User Manual

RFID READER WRITER MODULE
MODEL T-2212C

The purpose of this manual is to explain correct way how to integrate module T-2212C to the end product. It includes procedures that shall assist you to avoid unforeseen problems.

The T-2212C consists of an RFID reader / writer IC (CR95HF), a crystal resonator, an antenna, a ferrite sheet and so on and complies with FCC Part 15C, RSS-210 Issue 9 and RSS-Gen Issue 4.

Substrate dimensions	56 x 25
Substrate thickness	1.0
Substrate material	FR4
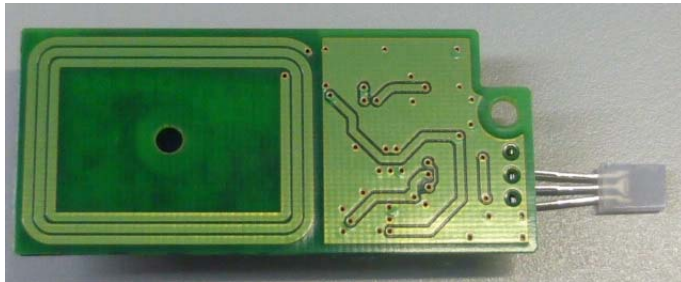
Main components used in the T - 2212C are explained below.

RFID reader writer IC (CR95HF)

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.

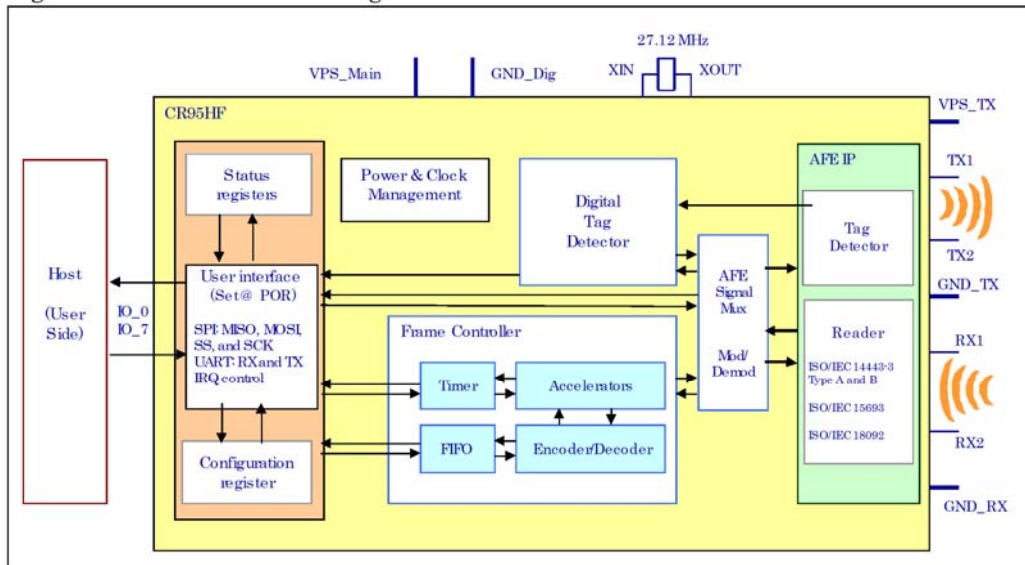The CR95HF embeds the Analog Front End for 13.56 MHz Air Interface.

The CR95HF supports ISO/IEC 14443 B protocols.

Figure 1. CR95HF application overview
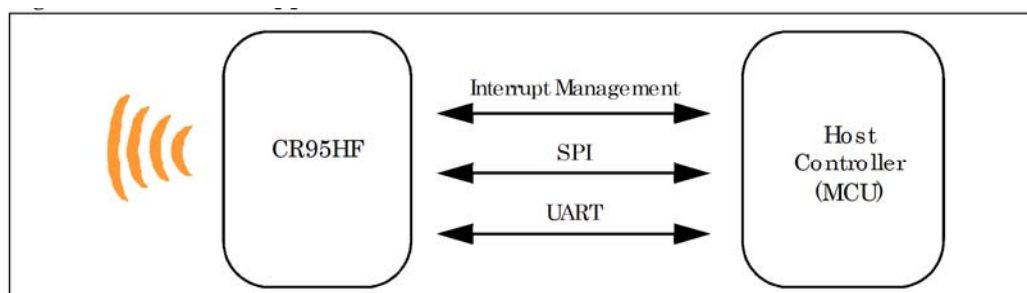
1.1 Block diagram

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 $\overline{IRQ\_IN}$ pin is the only wakeup source.
	Tag Detector	Low power consumption, Tag detection. Wakeup source is configurable: – Timer – $\overline{IRQ\_IN}$ pin – $\overline{SPI\_SS}$ 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
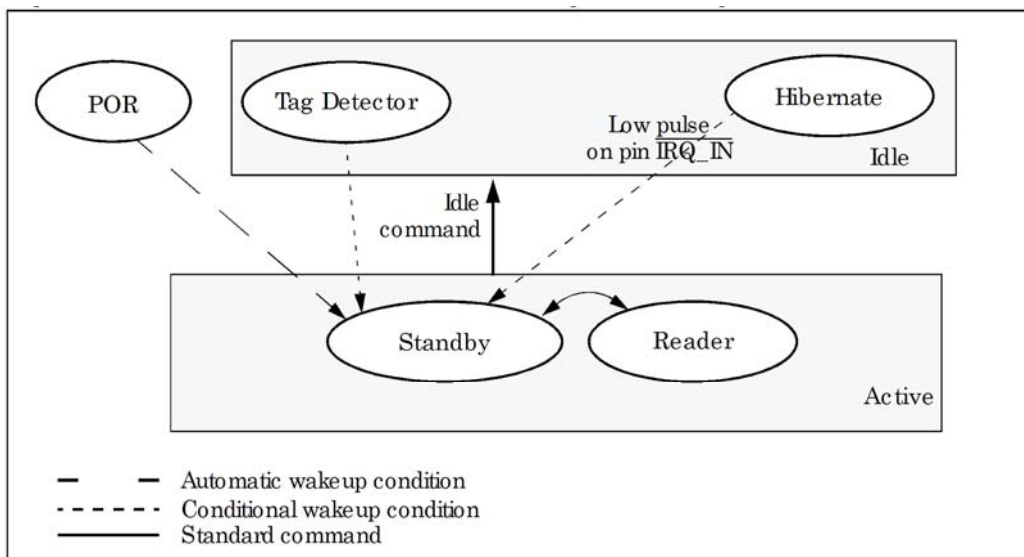
4 Electrical characteristics

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.

A CRYSTAL RESONATOR (DSX321G)

1 Electrical Characteristics

(This test shall be performed under the conditions of temp.at +25 ± 3°C, Relative Humidity 60% max.)

(1)NOMINAL FREQUENCY   27.120000   MHz

(2)OVERTONE ORDER   Fundamental

(3)LOAD CAPACITANCE(CL)   12.0 pF

(4)FREQUENCY TOLERANCE OVER ALL/   ±20 ppm max.   /   -10~ +60 °C

(5)DRIVE LEVEL   155   ±10 W

(6)SERIES RESISTANCE   50Ω   max.   (at Series)

(7)OPERATING TEMPERATURE RANGE   -10~ +60 °C

(8)SHUNT CAPACITANCE   2.0pF max.

(9)INSULATION RESISTANCE   500MΩ   min. / DC 100 ± 15V

(10)STORAGE TEMPERATURE RANGE   -40~ +85 °C

2 CONSTRUCTION

(1)DIMENSIONS AND MARKING
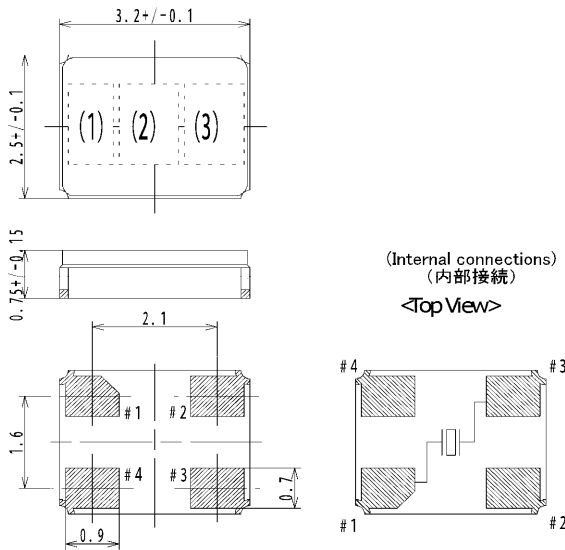
Logo(1)   * Made in INDONESIA   : Under Bar with D
              * Made in THAILAND   : Top Bar with D

Nominal Frequency (2) = Mark two digits from upper decimal point

Manufacturing lot No.(3)

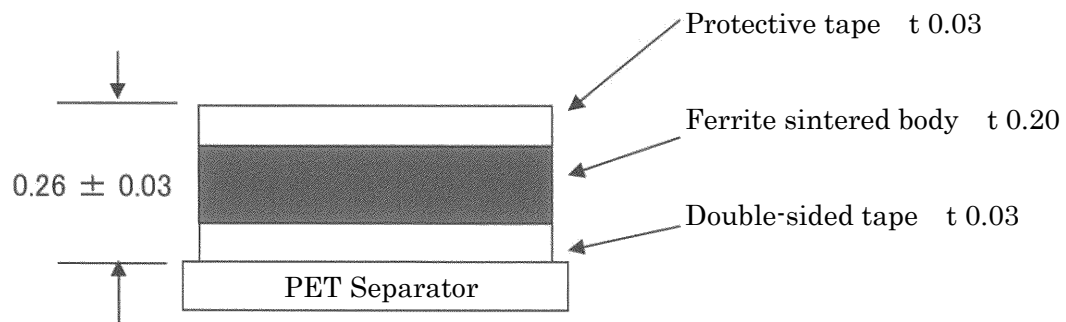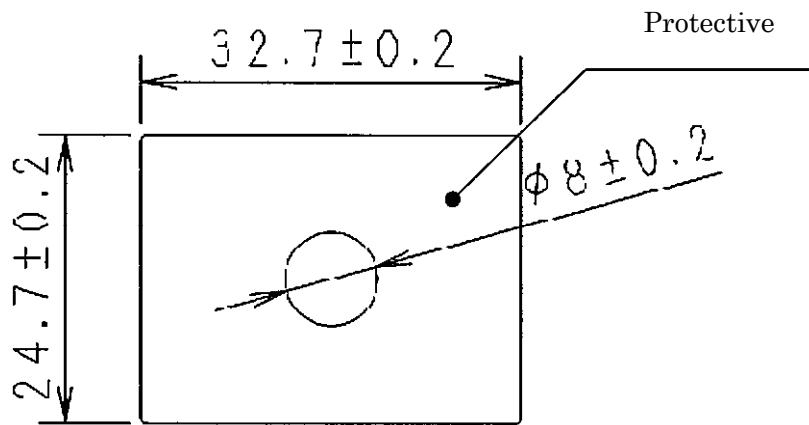# AN ANTENNA

1 Design and Verification

A FERRITE SHEET (UZ-0018)

1 External dimensions and structure

Protective

32.7±0.2

24.7±0.2

φ8±0.2

Protective tape　t 0.03

Ferrite sintered body　t 0.20

Double-sided tape　t 0.03

0.26 ± 0.03

PET Separator

Federal Communications Commission (FCC) Statement:

15.105(b)

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.

15.21:

You are cautioned that changes or modifications not expressly approved by the part responsible for compliance could void the user's authority to operate the equipment.

FCC RF Radiation Exposure Statement:

1.This Transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

2.This equipment complies with FCC RF radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 20 centimeters between the radiator and your body.

FCC RF Exposure requirements:

This device and its antenna(s) must not be co-located or operation in conjunction with any other antenna or transmitter.

15.19:

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 of the device.

Industry Canada Statement:

This device complies with ISED's applicable licence-exempt RSSs. Operation is subject to the following two conditions:

(1) This device may not cause interference; and

(2) This device must accept any interference, including interference that may cause undesired operation of the device.

RF Radiation Exposure Statement:

This equipment complies with IC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 20 centimeters between the radiator and your body.

Avis d'industrie Canada:

Le present appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisee aux deux conditions suivantes: (1) l'appareil ne doit pas produire de brouillage, et, and (2) l'utilisateur de l'appareil doit accepter tout brouillage radioelectrique subi, meme si le brouillage est susceptible d'en compromettre le fonctionnement.

RF exposure:

To comply with the IC RF exposure compliance requirements, this device and its antenna must not be co-located or operating in conjunction with any other antenna or transmitter. Pour se conformer aux exigences de conformite RF canadienne l'exposition, cet appareil et son antenne ne doivent pas etre co-localises ou fonctionnant en conjonction avec une autre antenne ou transmetteur.

Industry Canada Class B Emission Compliance Statement:

This Class B digital apparatus complies with Canadian ICES-003.

Avis de conformite a la reglementation d'Industrie Canada:

Cet appareil numerique de la classe B est conforme a la norme NMB-003 du Canada. Declaration d'exposition aux radiations: Cet equipement est conforme aux limites d'exposition aux rayonnements IC etablies pour un environnement non controle. Cet equipement doit etre installe et utilise avec un minimum de 20 cm de distance entre la source de rayonnement et votre corps.