

SONY®

FeliCa

Reader/Writer Module

RC-S620/S

Product Specifications

Version 1.1

No. Mxxx-Exx-xx

Introduction

This document describes the major features and specifications of Reader/Writer module of Sony, RC-S620/S. For the purpose of this document, the terms below denote the products or equipment described to the right.

- Card : A contactless IC card.
- Reader/Writer : A device used to read and write contactless IC cards, tags and devices.
- Controller : An external computer or an equivalent device that is directly connected to a Reader/Writer via a specific cable.

User applications can use some libraries including FeliCa libraries to access RC-S620/S. API specifications for these libraries vary depending on the products used, as well as the intended usage of the system, making it necessary to see the appropriate document for each.

Model name	Description	Usage	Reference document
RC-S620/S	UART for controller interfacing	For embedded device	"SDK for NFC Reference Implementation Basic Suite for RC-S956 API Specifications"

NOTE1 A driver for embedded devices, as well as FeliCa libraries, must be developed by yourself. For this purpose, the "SDK for NFC Reference Implementation Basic Suite for RC-S956" is optionally available.

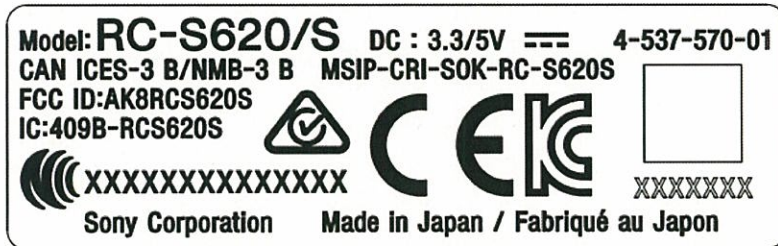
NOTE2 For beginning the services using specific card brands, it is necessary to obtain permission from companies which hold the right to use by yourself.

NOTE3 Please note that Business Opportunity Loss by failure or other causes cannot be compensated irrespective of the warranty period. The prior check of operation in your system is strongly recommended.

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Safety Information and Caution**WARNING**

To reduce the risk of fire or electric shock, do not expose this apparatus to rain or moisture.
To avoid electrical shock, do not open the cabinet. Refer servicing to qualified personnel only.



Contents of spec indication label

For the customers in USA

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.

WARNING

You are cautioned that any changes or modifications not expressly approved in this manual could void your authority to operate this equipment.

Note: 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.

For the customers in Canada

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

This device complies with Industry Canada licence-exempt RSS standard(s). 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.

The term "IC:" before the radio certification number only signifies that Industry Canada technical specifications were met.

Pour les clients au Canada

Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'utilisation doit répondre aux deux conditions suivantes: (1) ce matériel ne doit pas provoquer de brouillage et (2) il doit accepter tout brouillage, même celui qui est susceptible d'affecter son fonctionnement.

La mention « IC: » devant le numéro de certification/ homologation signifie uniquement que les spécifications techniques d'Industrie Canada sont remplies.

For the customers in Europe

Hereby, Sony Corporation, declares that this RC-S620/S is in compliance with the essential requirements and other relevant provisions of Directive 1999/5/EC.

For details, please access the following URL:

<http://www.compliance.sony.de/>



For use in following areas: residential, commercial and light industrial.

This product has been tested and found compliant with the limits set out in the EMC Directive for using connection cables not longer than 3 meters (9.8 feet).

Emissions from this inductive device could cause interference to nearby receivers of other radio services.

The manufacturer of this product is Sony Corporation,
1-7-1 Konan, Minato-ku, Tokyo, Japan

The Authorized Representative for EMC and product safety is Sony Deutschland GmbH,
Hedelfinger Strasse 61, 70327 Stuttgart, Germany

For the customers in Korea

해당 무선설비는 운용 중 전파혼신 가능성이 있음



인증번호: MSIP-CRI-SOK-RC-S620S

상호 또는 성명: 소니코리아(주)

기기명칭: RFID/USN 용 무선기기(13.56MHz 대역 사용 기기)

For the customers in Singapore**For the customers in Taiwan****第十二條**

經型式認證合格之低功率射頻電機，非經許可，公司、商號或使用者均不得擅自變更頻率、加大功率或變更原設計之特性及功能。

第十四條

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前項合法通信，指依電信法規定作業之無線電通信。

低功率射頻電機須忍受合法通信或工業、科學及醫療用電波輻射性電機設備之干擾。

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1 Key functions and features

RC-S620/S (hereinafter called the module) writes and reads data to and from FeliCa-enabled contactless IC cards. It can also write and read data based on the ISO/IEC 14443 communication standards. Immune to wear caused by dirt and friction, contactless operation leads to enhanced maintainability. Key functions and features of the module are detailed below.

- Based on an inductive read/write system type-certified by the Radio Law of Japan. It is also compliant with the relevant standards in the United States, Canada, and Europe.
- Compatible with devices such as mobile phones incorporating a Mobile FeliCa IC chip.

NOTE Not all of the processing sequences can be handled.

- Compactly designed with an integral antenna.
- Magnetic and metal sheets are attached to reduce the effects of the installation environment.
- UART serial interface for host controller communication.
- Power supply voltage supports 3.3 V and 5.0 V.

2 Hardware specifications

This chapter focuses on major hardware specifications.

2.1 Major specifications

The following describes the module's major specifications.

2.1.1 FeliCa communication

- Max. communication distance : 20 mm or more
(No dead zones of 1 mm or more wide within the above range)
<Measurement conditions>
In a free space (temperature: 25°C, humidity: 50%RH) that is potentially unaffected by nearby radio waves and magnetic sources, a single RC-S880 card (operating at its center frequency) is polled by a standard module. The card is placed so that its center aligns with the center of the module's antenna along a vertical axis perpendicular to the antenna surface, with its longitudinal edges maintained in parallel to those of the antenna, as shown in Figure 2-1.
- Carrier frequency (fc) : 13.56 MHz
- Data transfer rate^{*1} : fc / 64 (212 kbps, approximately), fc / 32 (424 kbps, approximately)
- Modulation system : Transmission – ASK
Reception – ASK
- Bit coding : Transmission – Manchester coding
Reception – Manchester coding
- Communication system : Half-duplex communication, CRC-ITU-T
- Compatible cards^{*2,*3} : RC-S850 Series (RC-S850, RC-S853, RC-S854, RC-S855)
RC-S860 Series (RC-S860, RC-S862, RC-S864)
RC-S880 Series (RC-S888, RC-S889)
FeliCa Lite (RC-S886, RC-S710)
- Compatible devices^{*4,*5} : Mobile phones incorporating a Mobile FeliCa IC chip (on which the Mobile FeliCa OS Version 2.0 is running)
(Products based on the 2009/1/15 FeliCa Validation Program)
FeliCa Plug/NFC Dynamic Tag (RC-S801, RC-S802)

Ad-hoc communication

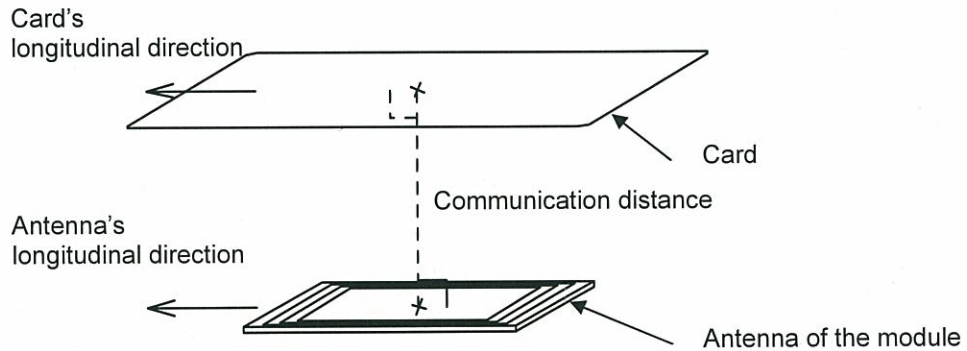
- Data transfer rate^{*6}
 - Initiator mode : fc / 64 (212 kbps, approximately), fc / 32 (424 kbps, approximately)
 - Target mode : fc / 64 (212 kbps, approximately)
- Compatible devices^{*7, *8} : Mobile phones incorporating a Mobile FeliCa IC chip (on which the Mobile FeliCa OS Version 2.0 is running)

NOTE Feasibility of data exchange and other functions necessary for application execution depends on the FeliCa Ad-hoc Link Protocol (FALP) on the device used to control the module and mobile phones, as well as the method of implementing the FALP-compatible application. For more information, please see the documents that accompany software development kit and individual applications of Sony (there is no description about FALP in an English version).

^{*1, *6} Available only when the card or the device to be used is also compatible with 424 kbps.

^{*2, *4, *7} Usable number of cards: One at a time.

^{*3, *5, *8} Please consult us in advance when using a card or a device other than the ones listed above. Such a card or device may differ in communication distance, making it necessary to verify its performance.



NOTE The relative positions of the card and the antenna are determined first by paralleling their longitudinal directions and second, by aligning their centers along an axis that intersects at right angles with the antenna.

Figure 2-1: Max. communication distance

2.1.2 ISO/IEC 14443 communication

- Carrier frequency (fc) : 13.56 MHz
- Data transfer rate : fc / 128 (106 kbps, approximately)
- Modulation system
 - Type A : Transmission – ASK
Reception – ASK
 - Type B : Transmission – ASK
Reception – BPSK
- Bit coding
 - Type A : Transmission – Modified Miller
Reception – Manchester coding with subcarrier
 - Type B : Transmission – NRZ
Reception – NRZ with subcarrier
- Communication system : Half-duplex communication
- Compatible cards^{*1} : MIFARE Classic, MIFARE Ultralight, MIFARE DESFire, Topaz/Jewel, Calypso CD Light
(ISO/IEC 14443 Type A, MIFARE and ISO/IEC 14443 Type B standards are supported)

^{*1} Please consult us in advance when using a card or a device other than the ones listed above. Such a card or device may differ in communication distance, making it necessary to verify its performance.

2.2 Interface

Interfacing between the module and the controller utilizes the connector described below.

2.2.1 Connector

- Model number: 08 6223 006 101 868+ made by KYOCERA Connector Products Corporation
Low-profile, 0.5 mm pitch FFC/FPC connector
(Au plated / Single terminal / SMT / Right angle / NON-ZIF / 6 poles)

NOTE1 For the contact point direction, see section 2.7 “External dimensions”.

NOTE2 For applicable cable, see section C.1 “Terminal requirements of FFC/FPC”.

NOTE3 Please consult the manufacturer for detailed specifications.

2.2.2 Pin assignment

Table 2-1: Pin assignment

No.	Designation	Function	Remarks
1	VDD	Power supply	DC3.3 V or DC5.0 V input
2	RXD	RXD signal	
3	TXD	TXD signal	
4	GND	Ground	For grounding
5	Reserve	Non	Requires OPEN processing by the controller
6	PRS (GND)	Module identification signal	Fixed at “L” (with GND grounded)

NOTE Please confirm the position of 1pin in external dimensions.

2.3 UART communication specifications

See the tables below for UART communication specifications.

Table 2-2: UART transfer rate

Transfer rate (bps)
9,600
19,200
38,400
57,600
115,200 (default)
230,400
460,800

Table 2-3: UART transactions

Item	Description
Start bit	1
Data bit	8
Parity	None
Stop bit	1
Flow control	None

2.4 Electrical specifications

2.4.1 Absolute maximum rating

Observe the following ranges of operation in order to avoid irreparable damage to the module.

Table 2-4: Absolute maximum rating

Item	Rating	Unit
Power supply voltage	-0.2 to +5.9	V
Input voltage	-0.2 to +5.9	V

2.4.2 Electrical characteristics

Table 2-5: Electrical characteristics

(Conditions) Temperature: 25 °C, Humidity: 50 %RH

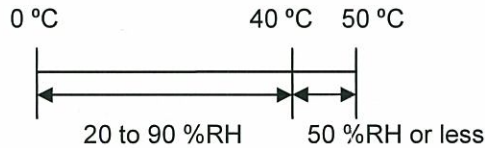
Item	Min	Max	Unit	Remarks
Power supply voltage (VDD) *1	3.15	3.45	V	DC input, GND = 0 V Ripple voltage: 50 mVpp or less Rate of rise at power-up: 1 V/μs or less Current capacity: 200 mA or more
	4.75	5.25	V	
Current consumption (I _{VDD}) *2		100	mA	RF ON: Approx. 70 mA RF OFF: Approx. 20 mA
Current consumption (I _{SPD})		100	μA	VDD = 3.3 V, During soft power down
		1000	μA	VDD = 5.0 V, During soft power down
Signal				
RXD H-level input voltage	VDD × 0.7	VDD	V	
RXD L-level input voltage	0	VDD × 0.3	V	
TXD H-level output voltage	2.48		V	VDD = 3.3 V, IOH = -6 mA
	3.8		V	VDD = 5.0 V, IOH = -12 mA
TXD L-level output voltage		0.5	V	VDD = 3.3 V, IOL = 6 mA
		0.6	V	VDD = 5.0 V, IOL = 12 mA

*1 Fully verify to noise from power supply, other modules and cables, since noise exerts deleterious effects on communication performance.

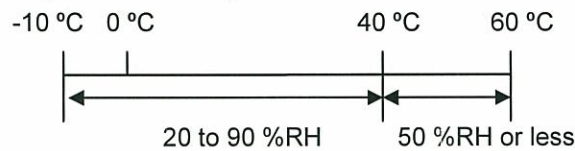
*2 Current consumption changes by power supply voltage, the existence of cards, installation.

2.5 Others

- Operating environment (no condensation or frost)
 - Performance assurance temperature/humidity^{*1}



- Function assurance temperature/humidity^{*2}

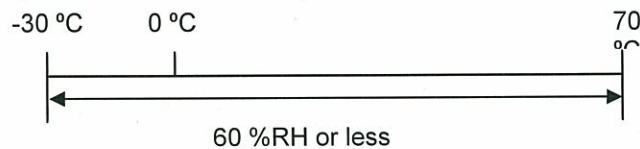


*1 Guarantees 80% of Max. communication distance (25 °C, 50 %RH) defined in section 2.1.1 "FeliCa communication" or more.

*2 Guarantees normal operation of the RF communication processor, although the communication performance described above cannot be assured in temperature extremes.

NOTE The board temperature inevitably rises if the Reader/Writer is continually transmitting card access commands (such as when polling a card). Make sure to design the enclosure so that the internal temperature and humidity can be held within the specified ranges.

- Storage environment (no condensation or frost)



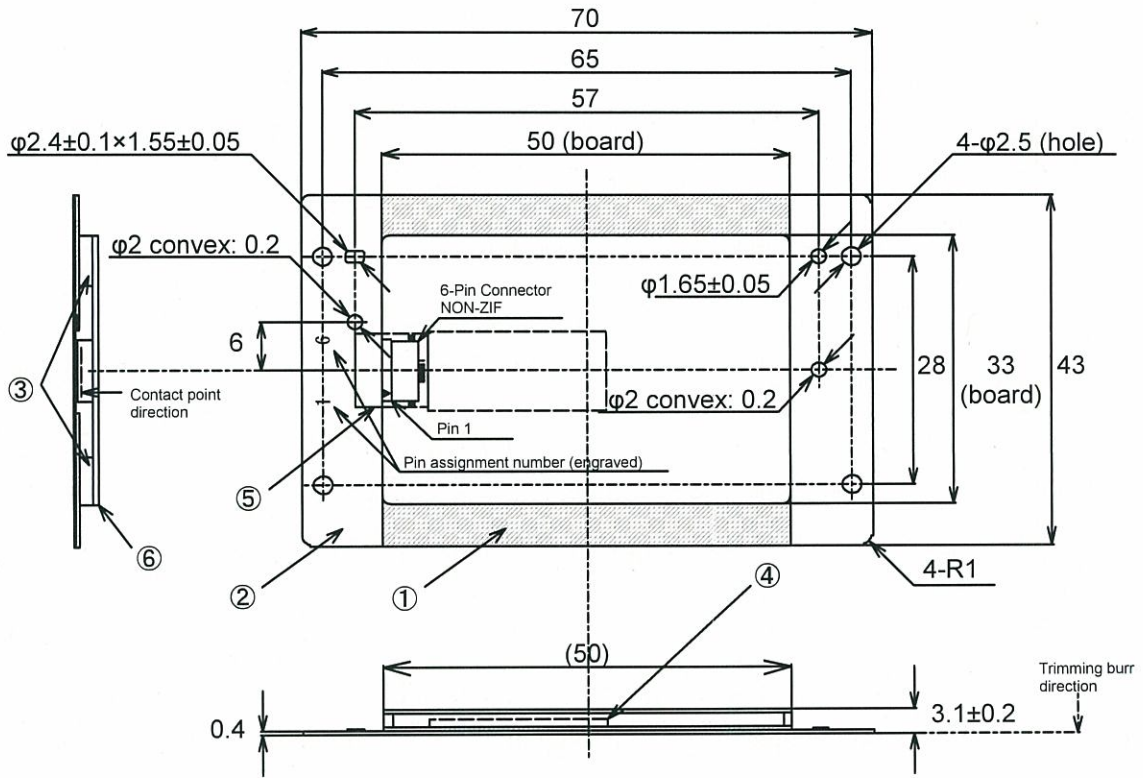
- Mass : Approx. 17 g

2.6 Reliability specifications

- Shock : IEC60068-2-27 Test Ea
- Vibration : IEC60068-2-64 Test Fh

2.7 External dimensions

External dimensions of the module are illustrated below.



No.	Parts	Material	Qty
1	Magnetic sheet	Soft magnetic sheet	1
2	Metal plate	SPTE	1
3	Spacer	Polyurethane foam	2
4	Cooling sheet	Silicon sheet	1
5	Insulating tape	Polyester tape	1
6	Board		1

Mesurement	Tolerance
< L ≤ 4	±0.1
< L ≤ 16	±0.2
< L ≤ 63	±0.3
< L ≤ 250	±0.4
< L ≤	±0.6

(Unit: mm)

Figure 2-2: External dimensions

2.8 Label specifications

2.8.1 Position of spec indication label

Position of spec indication label is shown in following a figure:

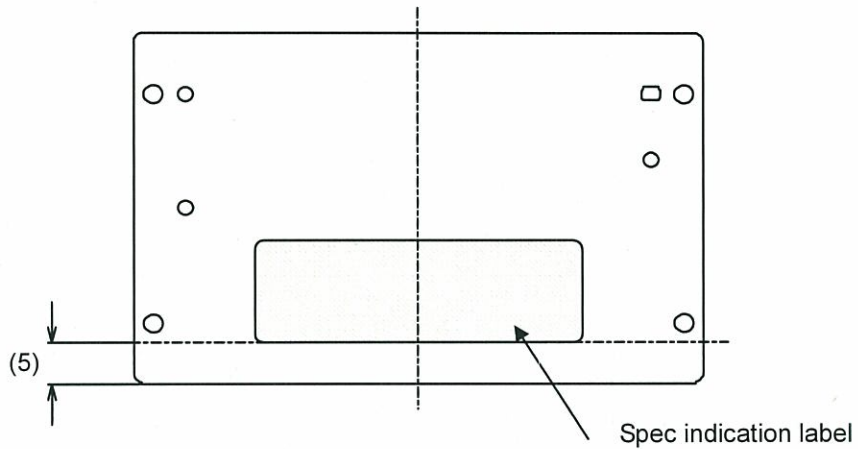


Figure 2-3: Position of spec indication label (metal plate)

2.8.2 Contents of spec indication label

Contents of spec indication label are shown in following a figure:



Figure 2-4: Contents of spec indication label

2.9 RF performance and the use of magnetic sheet

- RF (communication) performance is closely related to the effectiveness of the magnetic and metal sheets used below and around the antenna of the module.
- RF performance varies considerably, depending not only on the magnetic permeability (μ' , μ''), dimensions and thickness of the magnetic sheet but also on the dimensions and material of the metal sheet used. There is also a possibility that it is affected by metal in the installation environment.
- The module is designed to be used with the specified magnetic and metal sheets attached in advance to control the magnetic field generated by the antenna, as well as to minimize the possible effects from the installation environment.

This contributes a great deal to the reduction of the time required for weighing the effects of the installation environment and evaluating the module's RF performance.