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SpringCard OEM Modules with Antenna

Hardware integration guide

www.springcard.com

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1. Introduction

1.1. Abstract

SpringCard OEM product family is a large family of RFID/NFC readers & writers. This family contains OEM modules with USB (H663, H512) or without (K663, K632). To be operated, these modules shall be coupled to a RFID antenna.

SpringCard offers ready-to-use RFID/NFC readers & writers for OEM by installing its OEM modules on top of a **69 x 45 mm antenna**.

This document is the **hardware manual** for these readers & writers.

1.2. Product list

Product name	Order code	Description
RS-TTL interface		
K632-TTL	SC0305	K632 reader & writer with 69 x 45 antenna, RS-TLL interface
K632/RDR-TTL	not available	K632 standalone reader with 69 x 45 antenna, RS-TLL interface
K663-TTL	SC13137	K663 reader & writer with 69 x 45 antenna, RS-TLL interface
K663/RDR-TTL	SC13118	K663 standalone reader with 69 x 45 antenna, RS-TLL interface
RS-232 interface		
K632-232	SC0199	K632 reader & writer with 69 x 45 antenna, RS-232 interface
K632/RDR-232	SC9517	K632 standalone reader with 69 x 45 antenna, RS-232 interface
K663-232	SC3064	K663 reader & writer with 69 x 45 antenna, RS-232 interface
K663/RDR-232	SC13121	K663 standalone reader with 69 x 45 antenna, RS-232 interface

Product name	Order code	Description
RS-485 interface		
K632-485	not available	K632 reader & writer with 69 x 45 antenna, RS-485 interface
K632/RDR-485	SC9416	K632 standalone reader with 69 x 45 antenna, RS-485 interface
K663-485	SC14180	K663 reader & writer with 69 x 45 antenna, RS-485 interface
K663/RDR-485	SC14181	K663 standalone reader with 69 x 45 antenna, RS-485 interface
USB interface		
H663-USB	SC3016	H663 USB PC/SC coupler with 69 x 45 antenna
H512-USB	SC2235	H512 USB PC/SC coupler feat. card emulation with 69 x 45 antenna
H663/RDR-USB	SC13115	H663 standalone USB reader with 69 x 45 antenna

1.3. Related documents

Editor	Doc #	Description
SpringCard	PMD13204	K663 Group – Developer's reference manual
SpringCard	PMD2176	H512 Group – Developer's reference manual
SpringCard	PMD2271	H663 Group – Developer's reference manual
SpringCard	PMD13206	K663/RDR Group – Configuration & Software guide
SpringCard	to be written	H663/RDR Group – Configuration & Software guide

1.4. Audience

This manual is designed for use by electronic hardware integrators. It assumes that the reader has expert knowledge of digital and analog electronics.

1.5. Support and updates

Related documentation (e.g. product datasheets, application notes, sample software, HOWTOs and FAQs…) is available at SpringCard's web site:

www.springcard.com

Updated versions of this document and others are posted on this web site as soon as they are available.

For technical support enquiries, please refer to SpringCard support page, on the web at

www.springcard.com/support

1.6. Precautions for installation and use

The products depicted in this document are RFID/NFC couplers. Their antenna generates a magnetic field that creates an inductive coupling to both power and communicate with the card/tag that is present in the field.

Any metallic surface near the reader's antenna distorts the field and is likely to decrease the operating distance and to increase power consumption. It may even prevent any reader operation with all cards/tags or with some of them depending on their characteristics.

Precaution must be taken to keep readers far from any source of perturbation (e.g. other readers, computers…) and far from any metallic housing or shielding, electronics part.

Please refer to document PMI9C2P: Contactless Readers Installation Requirements for details.

2. Module + Antenna with Serial interface at TTL level

2.1. Products in this group

2.1.1. K632-TTL, K632/RDR-TTL

SpringCard K632 is a reader/writer module compliant with ISO/IEC 14443 (Proximity) and ISO/IEC 15693 (Vicinity).

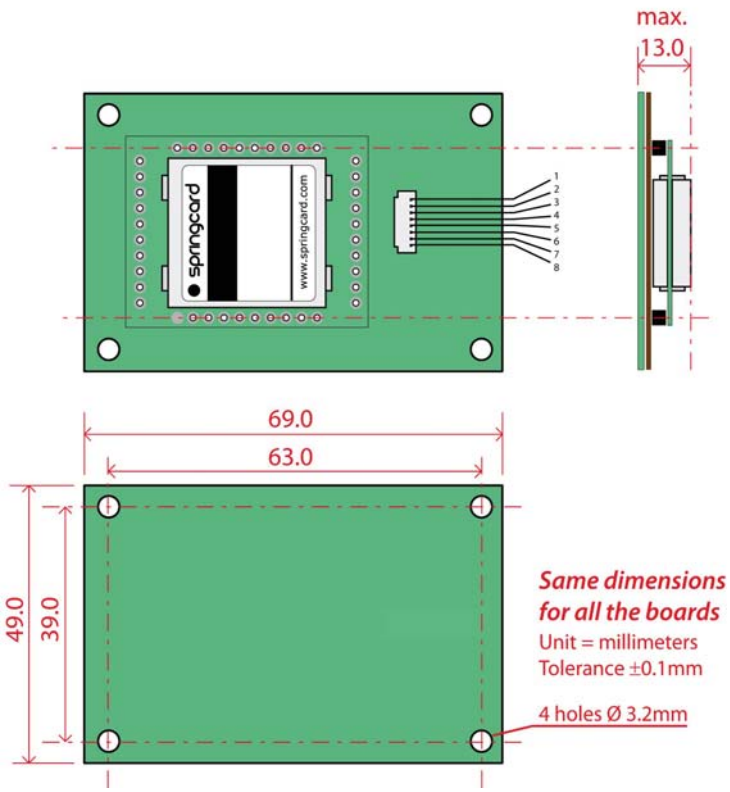
- **SpringCard K632-TTL** is this module mounted on **SpringCard's 69 x 45 unbalanced antenna**, featuring serial communication at TTL level (CMOS compatible).
- **SpringCard K632/RDR-TTL** is the same hardware running a “standalone reader” firmware.

2.1.2. K663-TTL, K663/RDR-TTL

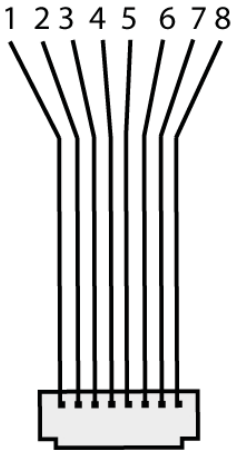
SpringCard K663 is a reader/writer module compliant with ISO/IEC 14443 (Proximity), ISO/IEC 15693 (Vicinity) and ISO/IEC 18092 (NFCIP-1).

- **SpringCard K663-TTL** is this module mounted on **SpringCard's 69 x 45 balanced antenna**, featuring serial communication at TTL level (CMOS compatible).
- **SpringCard K663/RDR-TTL** is the same hardware running a “standalone reader” firmware.

2.2. Mechanical specifications



2.3. Connector and pinout



Reference

JST SHR-08V -S -B

Pinout details

PIN	NAME	Type	Description	Remark
1	RFU		Not used	**Must be left unconnected**
2	/FLASH	IN	Firmware upgrade	Internal pull-up Can be left unconnected
3	GND	Ground	Ground	
4	/RESET	IN	Module reset	Internal pull-up Can be left unconnected
5	VCC	Power	Power supply	
6	RX (TTL)		Serial interface	Host to module
7	TX (TTL)		Serial interface	Module to host
8	GND	Ground	Ground	

2.4. K632-TTL, K632/RDR-TTL – Characteristics

Absolute maximum ratings

Stresses beyond those listed under 'Absolute Maximum Ratings' may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these conditions is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability

SYMBOL	Parameter	Min	Max	Unit
VCC_{ABS}	DC supply voltage with respect to ground	-0.3	6.0	V
$V_{IN,ABS}$	Voltage to any pin with respect to ground	-0.3	VCC+0.3	V
$T_{STORAGE}$	Storage temperature	-20	+70	°C

Operating condition range

SYMBOL	Parameter	Condition	Min	Typ	Max	Unit
$T_{OPERATION}$	Operating temperature		-20	+25	+70	°C
VCC	Supply voltage		3.0	5.0	5.5	V
ICC	Power supply current	Soft power down			6	mA
		RF field OFF		30	35	mA
		RF field ON		150	250	mA

Input pin characteristics

Pins RX, /SUSPEND and /FLASH have TTL input characteristics.

SYMBOL	Parameter	Min	Max	Unit
V_{IL}	LOW-level going threshold		0.8	V
V_{IH}	HIGH-level going threshold	2.0		V
I_{LEAK}	Input leakage current		4	µA

Output pin characteristics

Pin TX has TTL output characteristics.

SYMBOL	Parameter	Min	Max	Unit
V_{OL}	Output LOW-level		0.4	V
V_{OH}	Output HIGH-level	2.4		V
I_O	Output current source or sink		4	mA

2.5. K663-TTL, K663/RDR-TTL – Characteristics

Absolute maximum ratings

Stresses beyond those listed under 'Absolute Maximum Ratings' may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these conditions is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability

SYMBOL	Parameter	Min	Max	Unit
VCC_{ABS}	DC supply voltage with respect to ground	-0.3	6.0	V
$V_{IN,ABS}$	Voltage to any pin with respect to ground	-0.3	VCC+0.3	V
$T_{STORAGE}$	Storage temperature	-40	+80	°C

Operating condition range

SYMBOL	Parameter	Condition	Min	Typ	Max	Unit
$T_{OPERATION}$	Operating temperature		-20	+25	+70	°C
VCC	Supply voltage		3.0	5.0	5.5	V
ICC	Power supply current	Soft power down			6	mA
		RF field OFF		30	35	mA
		RF field ON		150	250	mA

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V_{OL}	Output LOW-level		0.4	V
V_{OH}	Output HIGH-level	2.4		V
I_O	Output current source or sink		4	mA

3. Module + Antenna with Serial interface at RS-232 level

3.1. Products in this group

3.1.1. K632-232, K632/RDR-232

SpringCard K632 is a reader/writer module compliant with ISO/IEC 14443 (Proximity) and ISO/IEC 15693 (Vicinity).

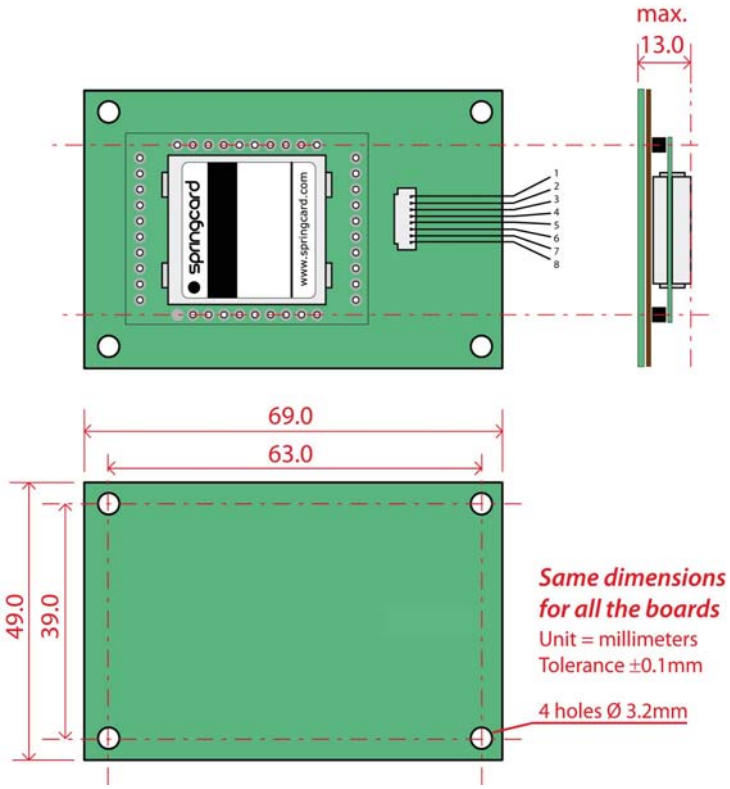
- **SpringCard K632-232** is this module mounted on **SpringCard's 69 x 45 unbalanced** antenna, featuring a serial communication link compliant with the RS-232 specification.
- **SpringCard K632/RDR-232** is the same hardware running a “standalone reader” firmware.

3.1.2. K663-232, K663/RDR-232

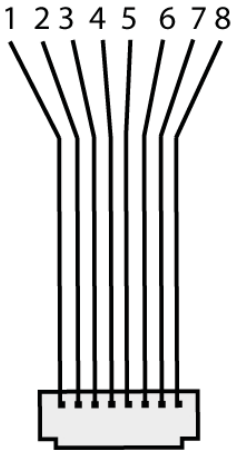
SpringCard K663 is a reader/writer module compliant with ISO/IEC 14443 (Proximity), ISO/IEC 15693 (Vicinity) and ISO/IEC 18092 (NFCIP-1).

- **SpringCard K663-232** is this module mounted on **SpringCard's 69 x 45 balanced antenna**, featuring a serial communication link compliant with the RS-232 specification.
- **SpringCard K663/RDR-232** is the same hardware running a “standalone reader” firmware.

3.2. Mechanical specifications



3.3. Connector and pinout



Reference

JST SHR-08V -S -B

Pinout details

PIN	NAME	Type	Description	Remark
1	RFU		Not used	**Must be left unconnected**
2	/FLASH	IN	Firmware upgrade	Internal pull-up Can be left unconnected
3	GND	Ground	Ground	
4	/RESET	IN	Module reset	Internal pull-up Can be left unconnected
5	VCC	Power	Power supply	
6	RX (RS-232)		Serial interface	Host to module
7	TX (RS-232)		Serial interface	Module to host
8	GND	Ground	Ground	

3.4. K632-232, K632/RDR-232 – Characteristics

Absolute maximum ratings

Stresses beyond those listed under 'Absolute Maximum Ratings' may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these conditions is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability

SYMBOL	Parameter	Min	Max	Unit
VCC_{ABS}	DC supply voltage with respect to ground	-0.3	6.0	V
$V_{IN,ABS}$	Voltage to any pin with respect to ground	-0.3	VCC+0.3	V
$T_{STORAGE}$	Storage temperature	-20	+70	°C

Operating condition range

SYMBOL	Parameter	Condition	Min	Typ	Max	Unit
$T_{OPERATION}$	Operating temperature		-20	+25	+70	°C
VCC	Supply voltage		4.5	5.0	5.5	V
ICC	Power supply current	Soft power down			6	mA
		RF field OFF		30	35	mA
		RF field ON		150	250	mA

Input pin characteristics

Pins /SUSPEND and /FLASH have TTL input characteristics.

SYMBOL	Parameter	Min	Max	Unit
V_{IL}	LOW-level going threshold		0.8	V
V_{IH}	HIGH-level going threshold	2.0		V
I_{LEAK}	Input leakage current		4	µA

RX pin characteristics

Pin RX is a RS-232 input.

SYMBOL	Parameter	Min	Max	Unit
V_{I0}	Logical "0" valid range	3	25	V
V_{I1}	Logical "1" valid range	-25	-3	V
I_{LEAK}	Input leakage current		4	µA

TX pin characteristics

Pin TX is a RS-232 output

SYMBOL	Parameter	Min	Max	Unit
V_{O0}	Logical “0” output level	6		V
V_{O1}	Logical “1” output level		-6	V
I_O	Output current source or sink		4	mA

3.5. K663-232, K663/RDR-232 – Characteristics

Absolute maximum ratings

Stresses beyond those listed under 'Absolute Maximum Ratings' may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these conditions is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability

SYMBOL	Parameter	Min	Max	Unit
VCC_{ABS}	DC supply voltage with respect to ground	-0.3	6.0	V
$V_{IN,ABS}$	Voltage to any pin with respect to ground	-0.3	VCC+0.3	V
$T_{STORAGE}$	Storage temperature	-40	+80	°C

Operating condition range

SYMBOL	Parameter	Condition	Min	Typ	Max	Unit
$T_{OPERATION}$	Operating temperature		-20	+25	+70	°C
VCC	Supply voltage		3.0	5.0	5.5	V
ICC	Power supply current	Soft power down			6	mA
		RF field OFF		30	35	mA
		RF field ON		150	250	mA

Input pin characteristics

Pins /SUSPEND and /FLASH have TTL input characteristics.

SYMBOL	Parameter	Min	Max	Unit
V_{IL}	LOW-level going threshold		0.8	V
V_{IH}	HIGH-level going threshold	2.0		V
I_{LEAK}	Input leakage current		4	µA

RX pin characteristics

Pin RX is a RS-232 input.

SYMBOL	Parameter	Min	Max	Unit
V_{I0}	Logical "0" valid range	3	25	V
V_{I1}	Logical "1" valid range	-25	-3	V
I_{LEAK}	Input leakage current		4	µA

TX pin characteristics

Pin TX is a RS-232 output

SYMBOL	Parameter	Min	Max	Unit
V_{O0}	Logical “0” output level	6		V
V_{O1}	Logical “1” output level		-6	V
I_O	Output current source or sink		4	mA

4. Module + Antenna with USB interface

4.1. Products in this group

4.1.1. H663-USB, H663/RDR-USB

SpringCard H663 is a reader/writer module compliant with ISO/IEC 14443 (Proximity), ISO/IEC 15693 (Vicinity) and ISO/IEC 18092 (NFCIP-1).

> ***SpringCard H663*** *is primarily designed for USB operation in a PC/SC compliant environment. Please refer to document PMD2271 "H663 Developer's Reference Manual" for details.*
> *When the module runs the "standalone reader" firmware (H663/RDR), it is also possible to use it as a virtual communication port (USB CDC ACM profile).*

- **SpringCard H663-USB** is this module mounted on SpringCard's balanced antenna.
- **SpringCard H663/RDR-USB** is the same hardware running a "standalone reader" firmware.

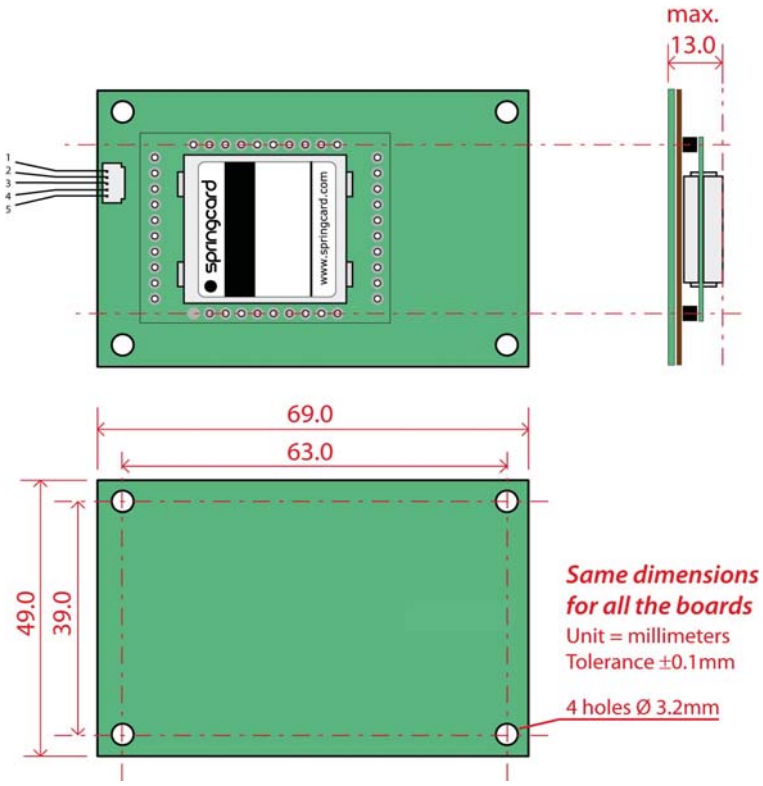
4.1.2. H512-USB

SpringCard H512 is a reader/writer module + NFC target coupler, compliant with ISO/IEC 14443 (Proximity) and ISO/IEC 18092 (NFCIP-1).

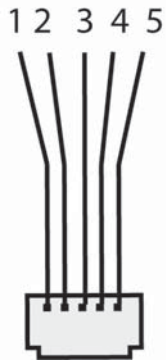
> ***SpringCard H512*** *is designed for USB operation in a PC/SC compliant environment. Please refer to document PMD2271 "H512 Developer's Reference Manual" for details.*

- **SpringCard H512-USB** is this module mounted on SpringCard's balanced antenna.

4.2. Mechanical specifications



4.3. Connector and pinout



Reference

JST SHR-05V -S -B

Pinout details

PIN	NAME	Type	Description	Remark
1	VCC	Power	Power supply from bus	
2	USB_DM	IN/OUT	USB D-	
3	USB_DP	IN/OUT	USB D+	
4	GND	Ground	Ground wire	
5	GND	Ground	Ground (shielding)	

4.4. H663-USB, H663/RDR-USB – Characteristics

Absolute maximum ratings

Stresses beyond those listed under 'Absolute Maximum Ratings' may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these conditions is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability

SYMBOL	Parameter	Min	Max	Unit
VCC_{ABS}	DC supply voltage with respect to ground	-0.3	6.0	V
$V_{IN,ABS}$	Voltage to any pin with respect to ground	-0.3	VCC+0.3	V
$T_{STORAGE}$	Storage temperature	-40	+80	°C

Operating condition range

SYMBOL	Parameter	Condition	Min	Typ	Max	Unit
$T_{OPERATION}$	Operating temperature		-20	+25	+70	°C
VCC	Supply voltage		4.5	5.0	5.5	V
ICC	Power supply current			150	250	mA

4.5. H512-USB – Characteristics

Absolute maximum ratings

Stresses beyond those listed under 'Absolute Maximum Ratings' may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these conditions is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability

SYMBOL	Parameter	Min	Max	Unit
VCC_{ABS}	DC supply voltage with respect to ground	-0.3	6.0	V
$V_{IN,ABS}$	Voltage to any pin with respect to ground	-0.3	VCC+0.3	V
$T_{STORAGE}$	Storage temperature	-40	+80	°C

Operating condition range

SYMBOL	Parameter	Condition	Min	Typ	Max	Unit
$T_{OPERATION}$	Operating temperature		-20	+25	+70	°C
VCC	Supply voltage		4.5	5.0	5.5	V
ICC	Power supply current			150	250	mA

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.
Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

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