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SpringCard TwistyWriter Series

Hardware integration guide

www.springcard.com

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Contents

1. Introduction

1.1. Abstract

SpringCard TwistyWriter Family is a family of OEM contactless coupling devices that includes three different products.

They all have the same board's width and length, the same holes but different thicknesses and connectors.

This document provides all necessary information to integrate these different **TwistyWriters** in your design and take benefit from all their features.

1.2. Product list

Product name	Order code	Description
TwistyWriter HSP	SC14190	Multi-interfaces USB & PC/SC contactless reader (coupling device), remote antenna
TwistyWriter -TTL	SC15111	Serial interface contactless reader (coupling device), remote antenna, RX/TX serial link at TTL level (0-5V), CMOS tolerant (0-3V)
TwistyWriter -232	SC14303	Serial interface contactless reader (coupling device), remote antenna, RX/TX serial link at RS-232 level (EIA 232 : -6/+6V)
TwistyWriter -485	SC15109	Serial interface contactless reader (coupling device), remote antenna, RS-485 (EIA 485) half-duplex serial link
TwistyWriter-IP PC/SC	SC16091	Ethernet & PC/SC contactless reader (coupling device), remote antenna.
TwistyWriter-IP+POE PC/SC	SC180011	Ethernet & PC/SC contactless reader (coupling device), remote antenna, powered by the network.

1.3. Related documents

Editor	Doc #	Description
SpringCard	PMD2271	H663 Group – Developer's reference manual
SpringCard	PMD15305	K663 CCID Developer's Guide
SpringCard	PMDE051	SpringProx Contactless Couplers Developer's Guide
SpringCard	PMI9C2P	Antenna Integration Guide

1.4. Audience

This manual is written for electronic hardware integrators. It then assumes that the reader has expert knowledge of digital electronics.

1.5. Important – read me first

All TwistyWriter **main boards** are 69x45mm PCBs. They need a **symmetric (balanced) antenna to operate.** The TwistyWriter's standard antenna is also a 69x45mm PCB, both boards could be stacked, which is a convenient setup for most situations.

In some situations, an other antenna design could be preferred, either to accommodate a constraint in size or placement, or to handle a particular type of contactless tags or cards.

SpringCard offers a few alternate antenna boards to meet most requirements. See our product portfolio here:

https://www.springcard.com/en/products/antennas

It is also possible to design a custom antenna. SpringCard engineers have a strong experience in antenna design. Please contact us should you need to discuss this opportunity.

1.6. 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

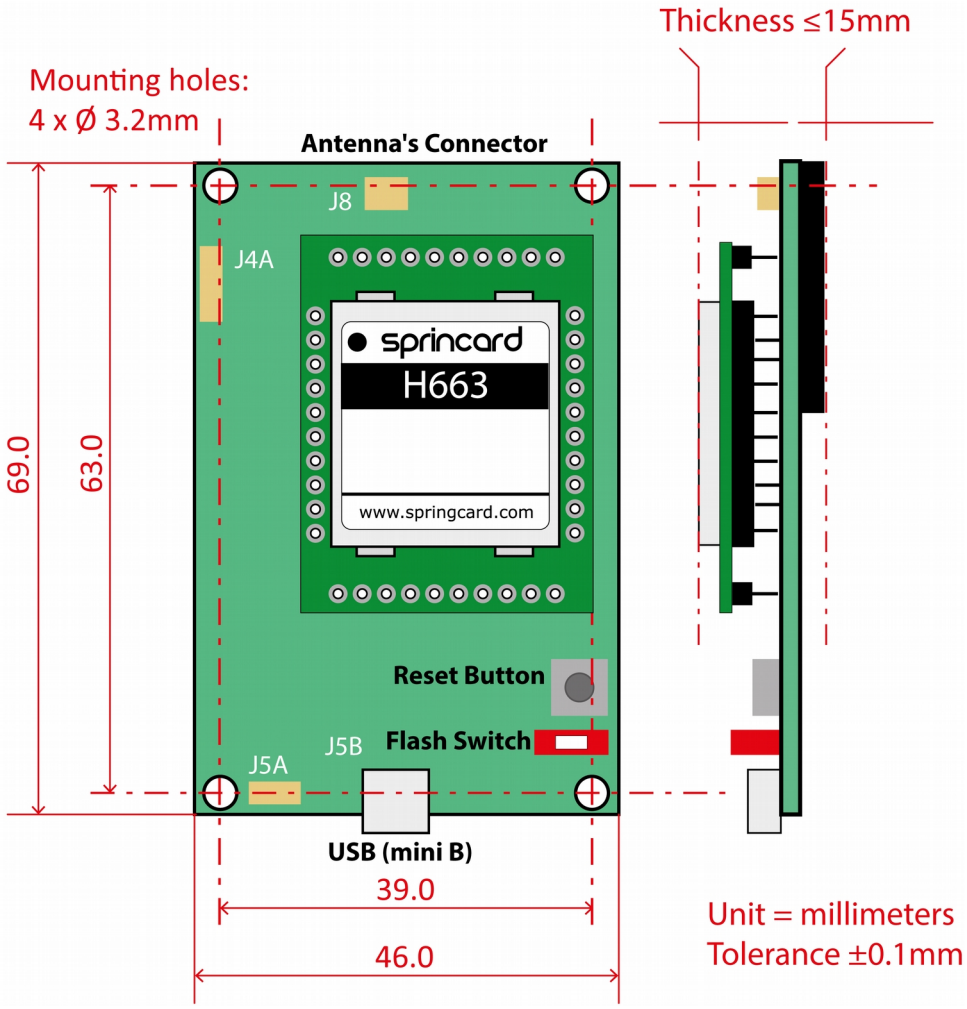
www.springcard.com/support

2. TwistyWriter HSP

2.1. Product list

Product name	Order code	Description
TwistyWriter HSP	SC14190	Multi-interfaces USB & PC/SC contactless reader (coupling device), remote antenna

2.2. Reference drawings



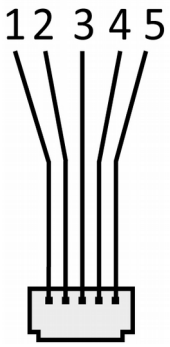
2.3. USB INTERFACE

The TwistyWriter HSP connects to the host computer through either J5A or J5B.

DO NOT connect both USB connectors (J5A and J5B) at the same time

2.3.1. J5A: USB JST SHR-5 connector

PIN	NAME	TYPE	DESCRIPTION
1	VBUS	Power	USB power supply (5V)
2	DM (ou D-)	IN/OUT	USB D-
3	DP (ou D+)	IN/OUT	USB D+
4	GND	Ground	Both ground wire and cord's shielding
5	GND	Ground	Both ground wire and cord's shielding



NB: SpringCard offers a matching USB cable:

https://www.springcard.com/en/products/cable-usb-a

2.3.2. J5B: mini B USB connector

Use this connector to connect the **TwistyWriter HSP** to a computer's USB port, using a standard USB mini B cable.

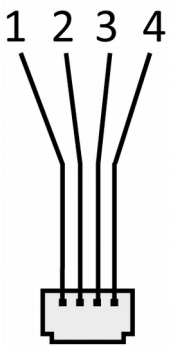
2.3.3. J4A: debug port

Leave this port unconnected

2.4. Antenna interface

2.4.1. J8: JST SHR4 antenna connector

PIN	NAME	TYPE
1	P_ANT	To antenna loop
2	GND	Ground
3	GND	
4	N_ANT	To antenna loop



2.5. USB profile and driver

2.5.1. Profile

The **TwistyWriter HSP** complies with

- USB, revision 2.0 (April 27rd, 2000),
- USB Device Class: Specification for Integrated Circuit(s) Cards Interface Devices (CCID), revision 1.1 (April 22rd, 2005),
- PC/SC part. 2, revision 2.01.01 (September 2005),
- PC/SC part. 3, revision 2.01.09 (June 2007),
- PC/SC part. 3 supplemental document, revision 2.01.08 (June 2011).

The **Vendor ID** is $_h$1C34 (SpringCard, formerly Pro Active), and the Product ID is $_h$91B1 (H663 module, CCID mode).

2.5.2. Drivers and software support

Please refer to document **PMD2271 : H663 Developer's reference manual** .

2.6. Electrical characteristics

2.6.1. 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
$I_{OUT,ABS}$	Total DC output current on all I/O pins		300	mA
$T_{STORAGE}$	Storage temperature	-20	+70	°C

2.6.2. Operating condition range

SYMBOL	Parameter	Condition	Min	Typ	Max	Unit
$T_{OPERATION}$	Operating temperature		-20	+25	+70	°C
VBUS	Supply voltage		4.5	5.0	5.5	V
ICC	Power supply current		6	100[1]	300	mA

[1] Conditions: RF field active, no contactless card, no contact card. The antenna has a strong impact on the current consumed by the module. Typical value is observed with SpringCard's 69x45mm balanced antenna.

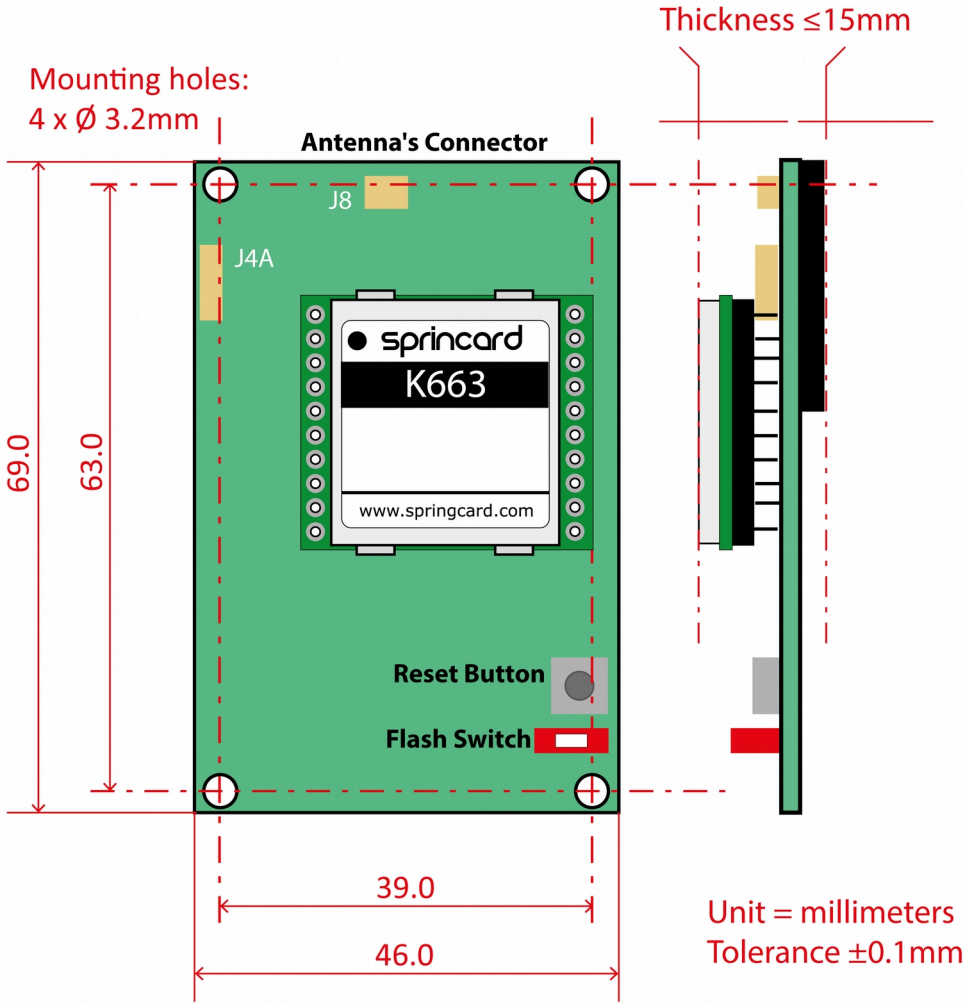
3. TwistyWriter-TTL, -232 or -485

3.1. Product list

Product name	Order code	Description
TwistyWriter -TTL	SC15111	Serial interface contactless reader (coupling device), remote antenna, RX/TX serial link at TTL level (0-5V), CMOS tolerant (0-3V)
TwistyWriter -232	SC14303	Serial interface contactless reader (coupling device), remote antenna, RX/TX serial link at RS-232 level (EIA 232: -6/+6V)
TwistyWriter -485	SC15109	Serial interface contactless reader (coupling device), remote antenna, RS-485 (EIA 485) half-duplex serial link

All products have exactly the same physical appearance. Always check the label carefully to verify which communication standard is implemented over the JST 8 port.

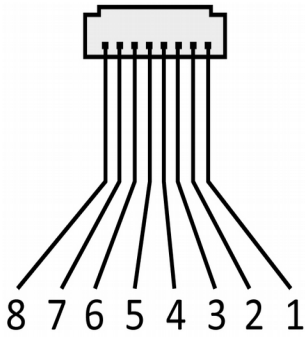
3.2. Reference drawings



3.3. Serial interface

3.3.1. J4A: Serial JST SHR-8 industrial connector

The J4A connector is a JST SHR-8 series (JST SHR-08V -S -B).



The pinout is common to all versions; they differ only on the 2 pins used by the serial communication.

3.3.2. Pinout of the RS-TTL version

PIN	NAME	Type	Description
1	RFU		Not connected
2	/FLASH	TTL/CMOS (in)	Drive the module's /FLASH input
3	GND	Ground	
4	/RESET	TTL/CMOS (in)	Drive the module's /RESET input
5	VCC	Power (in)	DC power supply
6	RX	Serial @ TTL/CMOS level	Host to module
7	TX	Serial @ TTL/CMOS level	Module to host
8	GND	Ground	

3.3.3. Pinout of the RS-232 version

PIN	NAME	Type	Description
1	RFU		Not connected
2	/FLASH	TTL/CMOS (in)	Drive the module's /FLASH input
3	GND	Ground	
4	/RESET	TTL/CMOS (in)	Drive the module's /RESET input
5	VCC	Power (in)	DC power supply
6	RX	Serial @ RS-232 level	Host to module
7	TX	Serial @ RS-232 level	Module to host
8	GND	Ground	

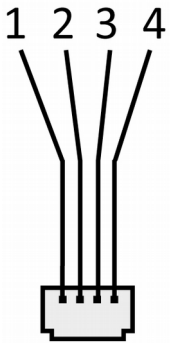
3.3.4. Pinout of the RS-485 version

PIN	NAME	Type	Description
1	RFU		Not connected
2	/FLASH	TTL/CMOS (in)	Drive the module's /FLASH input
3	GND	Ground	
4	/RESET	TTL/CMOS (in)	Drive the module's /RESET input
5	VCC	Power (in)	DC power supply
6	BUS_A	RS-485 A	
7	BUS_B	RS-485 B	
8	GND	Ground	

3.4. Antenna interface

3.4.1. J8: JST SHR4 antenna connector

PIN	NAME	TYPE
1	P_ANT	To antenna loop
2	GND	Ground
3	GND	
4	N_ANT	To antenna loop



3.5. Electrical characteristics

3.5.1. 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
$I_{OUT,ABS}$	Total DC output current on all I/O pins		200	mA
$T_{STORAGE}$	Storage temperature	-20	+70	°C

3.5.2. 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		6	100	250	mA

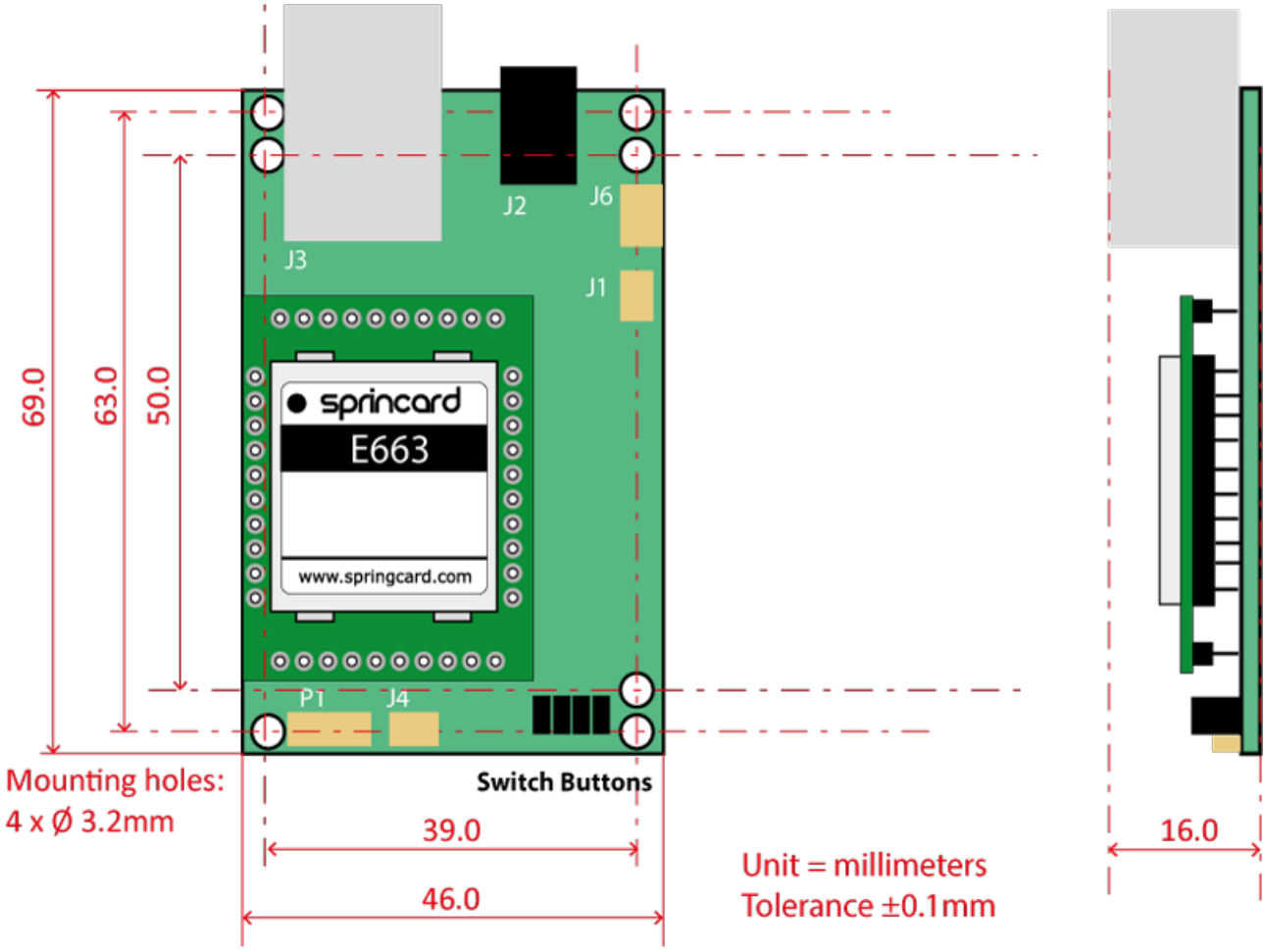
4. TwistyWriter-IP PC/SC

4.1. Product list

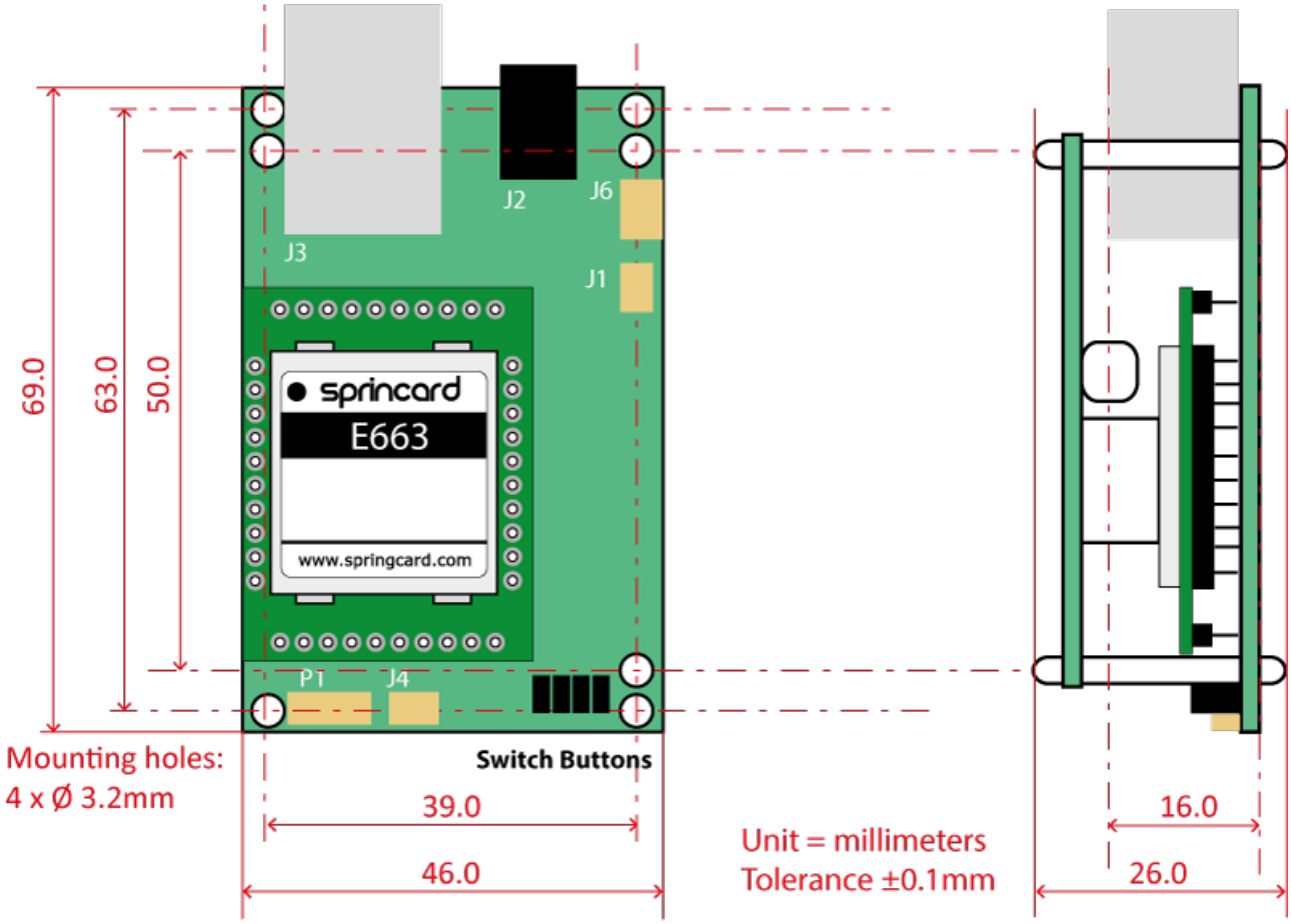
Product name	Order code	Description
TwistyWriter-IP PC/SC	SC16091	Ethernet & PC/SC contactless reader (coupling device), remote antenna.
TwistyWriter-IP+POE PC/SC	SC180011	Ethernet & PC/SC contactless reader (coupling device), remote antenna, powered by the network.

4.2. Reference drawings

TwistyWriter-IP PC/SC : SC16091



TwistyWriter-IP POE PC/SC : SC180011



4.3. Network interface

J3 is a standard Ethernet RJ45 connector.

The device supports either 10 Mbit/s and 100 Mbit/s bitrates. Device's default configuration is auto-negotiation, but a fixed bitrate may be chosen by configuration.

The Ethernet cable shall be at least Cat 5 (24 AWG).

Power Other Ethernet (POE) safety warning:

When the power-by-the network feature is used (POE version only), the Ethernet cable conveys a 48 V DC (typ.) Do not touch unprotected pins.

THE DEVICE MUST BE ENCLOSED IN AN INSULATION SHELL (plastic or ground-connected outer shield) to be used with Power Over Ethernet safely.

When POE power is used, typical power consumption is 1.6W.

4.4. Power supply

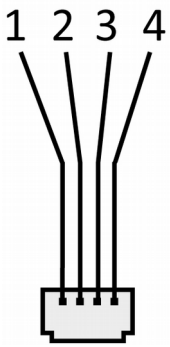
J2 is a 2.1 mm power jack socket.

Power supply should be between 5 and 24V DC.

4.5. Antenna interface

4.5.1. J8: JST SHR4 antenna connector

PIN	NAME	TYPE
1	P_ANT	To antenna loop
2	GND	Ground
3	GND	
4	N_ANT	To antenna loop



4.6. Other interfaces

4.6.1. JST SHR5 USB port

J1 is a USB connector (see § 2.3.1 for pinout). J1 is only used to upgrade the device's firmware ("flash").

Leave J1 unconnected for normal operation.

4.7. Switches

The device has 4 switches. The table below explains their roles and shows the "normal" positions in bold.

SWITCH	Description	Behaviour if OFF	Behaviour if ON
1	RFU	*Do not use*	***Must remain ON***
2	Flash Mode	**Normal operation**	USB flash mode
3	RFU	*Do not use*	***Must remain ON***
4	"Panic" mode	**Normal operation**	IP address is fixed to 192.168.0.250, most configuration settings are bypassed

Leave the switches in position ON OFF ON OFF for normal operation.

4.8. Electrical characteristics

4.8.1. 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	26.0	V
$V_{IN,ABS}$	Voltage to any pin with respect to ground	-0.3	VCC+0.3	V
$I_{OUT,ABS}$	Total DC output current on all I/O pins		200	mA
$T_{STORAGE}$	Storage temperature	-20	+70	°C

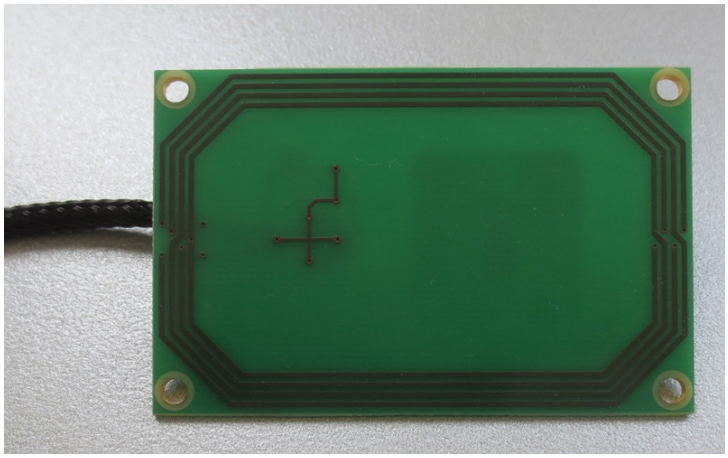
4.8.2. Operating condition range

SYMBOL	Parameter	Condition	Min	Typ	Max	Unit
$T_{OPERATION}$	Operating temperature		-20	+25	+70	°C
VCC	Supply voltage	on Jack	5.0	24.0	24.5	V
ICC	Power supply current	VCC=5.0 V		310	600	mA
		VCC=9.0 V		170	350	
		VCC=12.0 V		130	250	

5. Antenna Board

5.1. Product list

Product name	Order code	Description
69x45 mm balanced antenna	SC14358	SpringCard's standard antenna for all devices in the TwistyWriter family

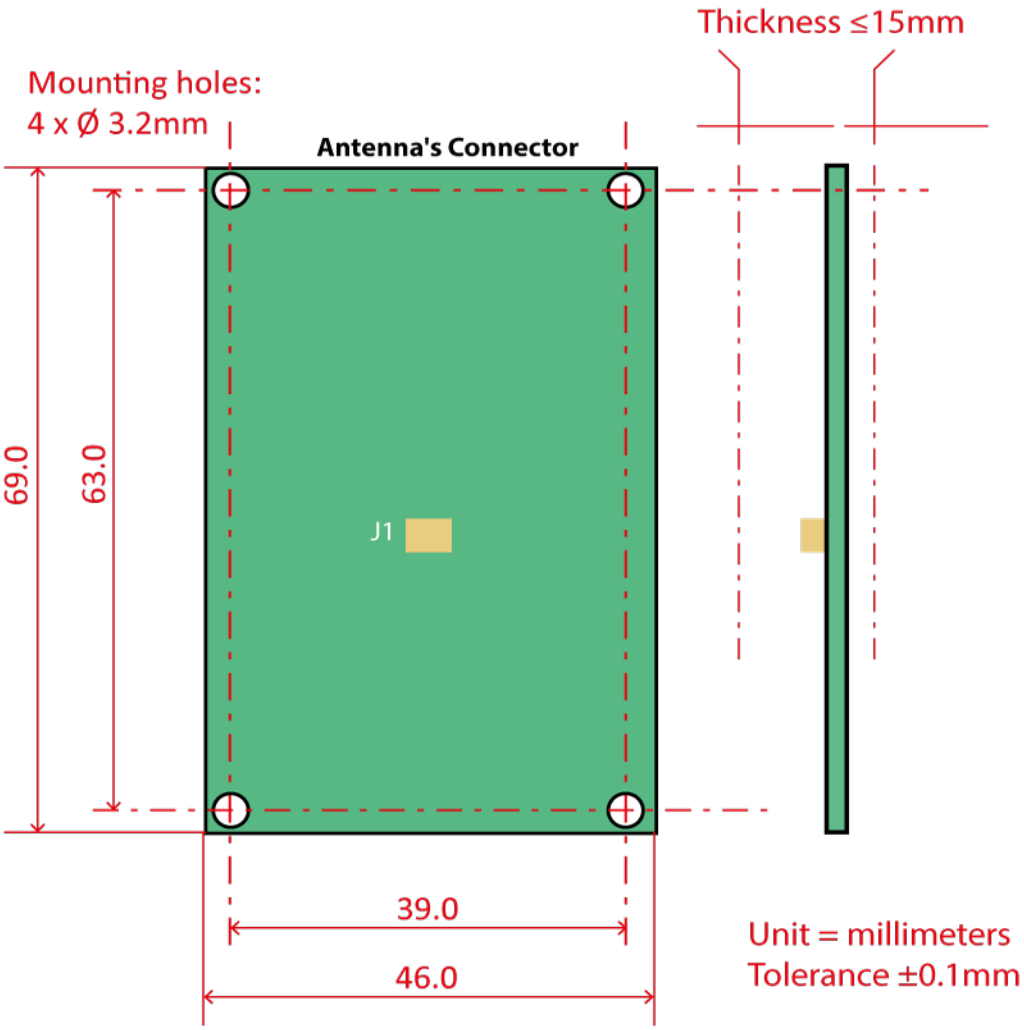


SpringCard's portfolio includes may over antennas:

https://www.springcard.com/en/products/antennas

Contact sales@springcard.com should you need another antenna, or to have a specific antenna designed for your project.

5.2. Reference Drawings

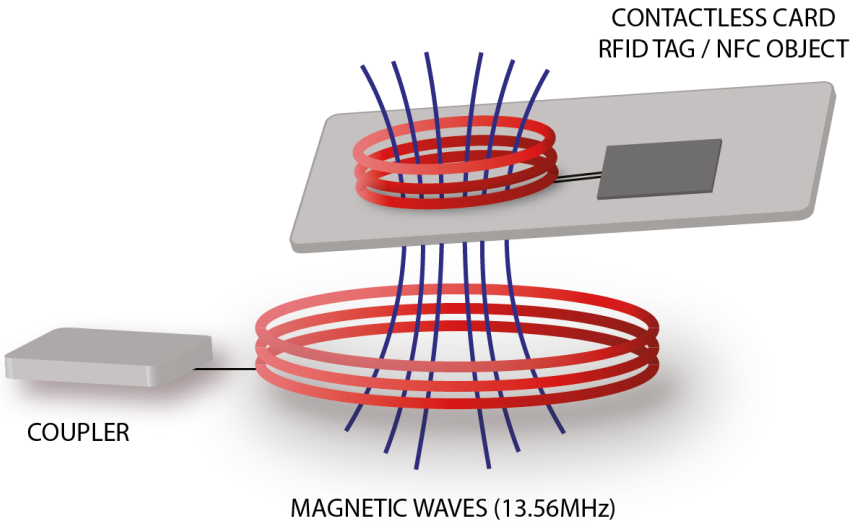


5.3. Installation and precautions

The coupler's antenna communicate with the card using **inductive coupling** (near field radio, i.e. magnetic waves).

- Magnetic waves are not able to cross any conductive surface (metal, metal-loaded plastics or paintings, PCD ground layers). For this reason, there shall be **no conductive surface between the antenna and the card**.
- Magnetic waves induce eddy current (Foucault currents) in any conductive surface. The eddy current reduces dramatically the practical distance where contactless cards could be “seen”, for a large part of the RF field is transformed into heat. That's why there shall be **no conductive surface in the nearby**.

- The propagation of the magnetic waves is tied to the magnetic permeability of the medium (μ). Most plastic materials, as well as dry air, have more or less the same permeability as the vacuum (μ_0) and allow the RF field to propagate well. On the other hand, **metal, wet organic materials** or any particular materials which magnetic permeability is too **far from the magnetic permeability of the vacuum** ($\mu_R \neq 1$) **shall be avoided**.



Please refer to document [PMI9C2P] "Antenna Integration Guide" for a complete reference.

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