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USER Manual

Axxin Kinetic RFID Reader

Module

Version 1.0
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1.0	First Release	JCH	15 June 2010

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1 PRODUCT DESCRIPTION

The *Axxin Kinetic RFID Reader* (Axxin P.N. P002264) is a compact HF RFID reader module with integrated antenna, crystal and a flexible SPI based interface with external microcontroller.

The module is to be fitted primarily (but not exclusively) into Axxin design products.

The module is based on an industry standard Texas Instruments TRF7960 silicon (fully integrated, multi-standard HF 13.56MHz, reader system) and supports ISO15693 standard RFID Tags, optionally ISO14443A and ISO14443B Tags support may be implemented if required (additional EMC and RF tests and certification may be required in such cases).

The module requires external microcontroller for operation and initialization using simple SPI and GPIO based interface.

This manual includes a list of Axxin RFID module features, a brief description of the module, specifications, details on instruction for configuration and integration.

Please note that the module is designed and meant to be used as a standard configuration of TRF7960 silicon based 'RFID Front End' and therefore it's not the purpose of this manual to provide a fully comprehensive description of module functionality and features as they are included in TRF7960 silicon related documentation, which should be used for the purpose of module integration into equipment.

Axxin Kinetic RFID Reader front and rear view

This warning symbol is used to mark any section of this user manual where a specific warning or caution is provided.

1.1 FEATURES

The *Axxin Kinetic RFID Reader* module features include:

- Auto detecting tag up to 80mm, depending on tag
- Self contained on-board 13.56MHz Crystal and a loop antenna
- SPI Communication interface
- Self contained regulator supporting 3.3V and 5V input
- Programmable Output power (100mW or 200mW)
- Programmable ASK, OOK Modulation levels
- Support ISO15693 protocol (optional ISO14443A and ISO14443B)
- 14-pin connector

1.2 ABREVIATIONS

RFID	Radio Frequency Identification
ASK	Amplitude Shift Key
OOK	ASK 100% modulation Level

1.3 REFERENCES

SLou186E	TRF7960 Multi-Standard Fully integrated 13.56MHz Radio Frequency Identification Analogue Front End and Data Framing Reader System data sheet

1.4 Warning and Safety Use

Safety Warnings :

Caution: Do not move, plug or unplug module while operating or when 3.3V and 5V Power Rails are available on the interface connector.

Caution: Ensure that the Reader Module is correctly plugged in and in the correct orientation before powering the equipment. Powering the equipment with an incorrectly plugged in Reader Module may cause permanent module damage.

Caution: ESD Sensitive Equipment.
Axxin Kinetic RFID Reader module is sensitive to Electrostatic Discharge.
The appropriate ESD protection procedures should be in place when handling the module to avoid possible damage.

1.5 SAFE USE GUIDELINES

Axxin Kinetic RFID Reader is designed to operate safely under these conditions:

- Indoor use (protected from water)
- Altitude up to 2000m
- Temperature 0°C to 60°C
- Maximum relative humidity 70% for temperatures to 35°C (non-condensing)

2 HARDWARE DESCRIPTION

The *Axxin Kinetic RFID Reader* module is designed on the basis of Texas Instruments' TRF7960 chip. The module has a 13.56MHz Crystal, an integrated loop antenna tuned to 13.56MHz, and a 14-pin connector providing connection to external equipment.

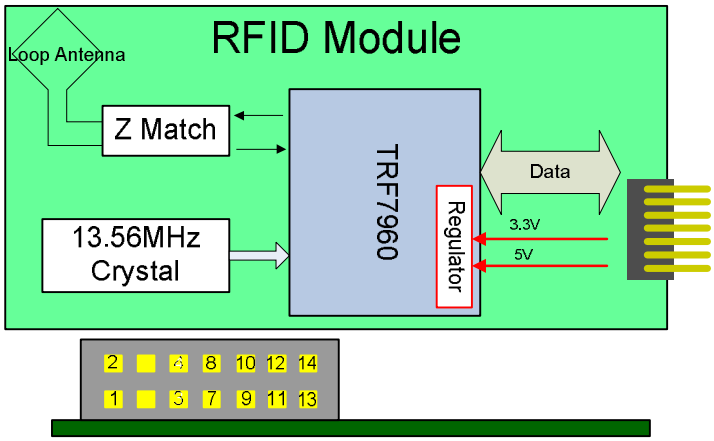

Figure 2.1 Block Diagram

Pin Description

Pin No.	Pin name	Description
1	GND	Ground
2	GND	Ground
3	5V_EXT	5V power supply connection
4	5V_EXT	5V power supply connection
5	SPI_CLK	SPI clock
6	TRF7960_EN1	TRF7960 power EN1 (Pull down)
7	GND	Ground
8	SPI_MOSI	SPI data input
9	SPI_CS	SPI chip selection (Pull up)
10	SIP_MISO	SPI data output (Pull up)
11	Direct Mode	Direct Mode, High for mode 1, Low for mode 0
12	3V3_EXT	3.3V power supply connection (used only for logic interface section)
13	Module RFID	Modulation selection, High for ASK, Low for OOK
14	IRQ	Interrupt

Table 2.1

Electrical Characteristics

Parameter	Rating
5V_EXT	5V DC +/-5%
3.3V_EXT	3.3V DC +/-5%
Operating current	5V Rail: 120mA typical @ Max 200mW power output 3.3V Rail: 20mA maximum
SPI level	3.3V
Logic level	3.3V
Operation Temperature	0°C TO 60°C

Table 2.2

3 INTEGRATION

Axxin Kinetic RFID Reader module is designed primarily (but not exclusively) for integrating into Axxin designed equipment.

3.1 INTERFACE CONNECTOR

The module interface consists of standard 14-pin dual row 1.27mm pitch connector. Drawing of the mating socket connector, into which the Axxin RFID module can be plugged, is shown in Figure 3.1

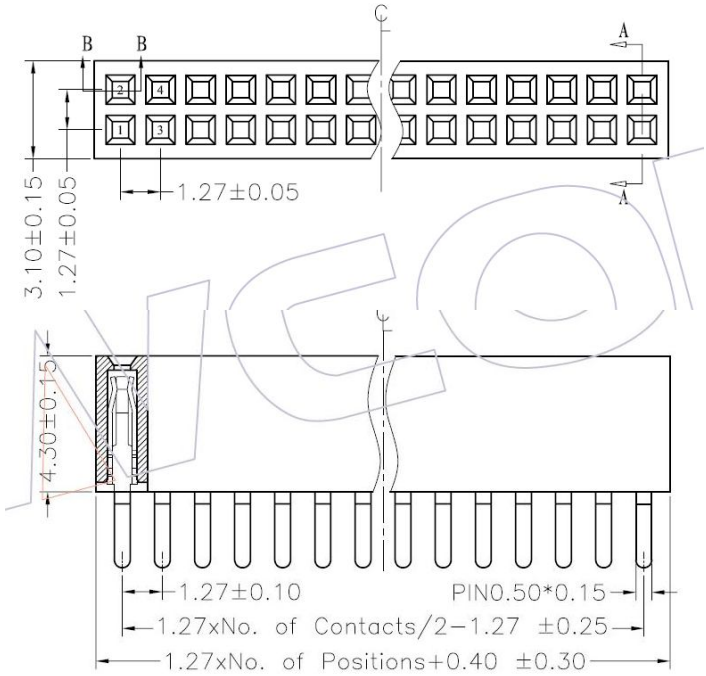

Figure 3.1 Mating socket connector

3.2 INTERFACE SIGNALS LEVELS

Interface signals between *Axxin Kinetic RFID Reader* module and equipment can be divided into 3 categories:

1. **SPI interface** signals (**SPI_CS, SPI_CLK, SPI_MISO, SPI_MOSI**) are 3.3V Logic level (please refer to SPI interface standard and TRF7960 data sheet for details)
2. **Control signals (TRF7960_EN, Direct Mode, Module RFID, IRQ**) are 3.3V logic level.
3. **Power Supply** Rails **(3.3V, 5V**), refer to current voltage requirements listed elsewhere in this manual.

3.3 METALS IN PROXIMITY AND EFFECT ON ANTENNA

Please note that metallic object in close proximity of Reader Module can affect the reading distance, in severe situations additional antenna tuning may be required.

3.4 READING DISTANCE

Typical expected Tag reading distance from module's antenna is around 40 -50mm.
The distance will be affected by shape and size of used Tag, proximity of metallic objects, Tag position with respect to antenna etc…

3.5 POWER RAILS REQUIREMENTS

Axxin Kinetic RFID Reader module is powered by 5V DC and 3.3V DC. The power supply specifications must meet the requirements in Table 2.1 and Table 2.2

3.6 CONTROLLER REQUIREMENTS

Axxin Kinetic RFID Reader module requires external microcontroller for both initialization and functionality.
Interface between Reader module and external microcontroller consist of a standard 4 wire SPI interface (with CS) and 4 GPIO signals and should meet the following requirements:

- 3.3V logic level GPIO
- SPI interface with SS, for details please refer to TRF7960 Data sheet (SLou186E), Page 39-42.

3.7 MECHANICAL SUPPORT

RFID module should be supported mechanically by using preferably non-metallic bracket. This ensures fixed position of the antenna, proper electrical interface connections and mechanical reliability of the assembly.

4 CONFIGURATION & REGISTERS

Reader module requires initialization and commands from external microcontroller for operation.

Both initialization and commands are based on writing and reading to TRF7960 registers as per TRF7960 data sheet and related application notes.

For complete details regarding list of registers, their content and functionality please refer to TRF7960 Data sheet (SLou186E).

Note: 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.

U.S. Regulatory Wireless Notice

Federal Communication Commission Interference Statement

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 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.

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

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.

IMPORTANT NOTE:

FCC Radiation Exposure Statement:

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

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

This device is intended only for OEM integrators under the following conditions:

1) The antenna must be installed such that 20 cm is maintained between the antenna and users, and
2) The transmitter module may not be co-located with any other transmitter or antenna,

IMPORTANT NOTE: In the event that these conditions can not be met (for example certain laptop configurations or co-location with another transmitter), then the FCC authorization is no longer considered valid and the FCC ID can not be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization.

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End Product Labeling

This transmitter module is authorized only for use in device where the antenna may be installed such that 20 cm may be maintained between the antenna and users. The final end product must be labeled in a visible area with the following: “Contains FCC ID: YKYAXKNRFID10”.

Manual Information To the End User

The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user’s manual of the end product which integrates this module.

The end user manual shall include all required regulatory information/warning as show in this manual.