PJM Light

SRF 66V01ST

Intelligent 1 kbit EEPROM with Contactless Interface compliant to ISO/IEC 18000-3 Mode 2

Chip Card & Security

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Information

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PJM Light - SRF 66V01ST Short Product Information

Revision History: Current version 2009-02-26

Previous Release: 2008-11-10

Page	Subjects (major changes since last revision)
8	corrected memory configuration

Trademarks

PJM StackTag®, PJM ItemTag® of Magellan Technology Ltd. Pty.

Features

Intelligent 1 kbit EEPROM
with Contactless Interface compliant to ISO/IEC 18000-3 Mode 2

Contactless Interface

- Physical interface and Anticollision compliant to ISO/IEC 18000-3 Mode 2
  - Contactless transmission of supply energy and data
  - Carrier frequency: 13.56 MHz
  - Command rate of 424 kbit/s
  - Reply rate of 106 kbit/s with channel hopping over eight channels or 424 kbit/s over one channel
  - Anticollision with identification rate of up to 1500 tags/s
  - Tag inventory capacity greater than 32,000 tags
- Read / write distance up to 50 cm (depending on reader antenna configuration)

1 kbit EEPROM

- Word organization of memory
  - up to 57 words of user memory (word size 16 bits)
  - page size 4 words
- Unique identification number (SID)
- EEPROM Error Correction Unit (ECC) to validate data integrity
- EEPROM programming time per page < 4 ms
- EEPROM endurance minimum 100,000 erase/write cycles[1]
- Data retention minimum 10 years[1]

Chip Functionality

- Tags can be identified even when closely stacked
- Optimized command set for fast identification and chip operation

Privacy Features

- Permanent write locking of user memory words (incrementally and user defined)
- Optional 48 bit password protection for write access

Electrical characteristics

- ESD protection minimum 2 kV
- Ambient temperature: -25 ... +70°C (for the chip)

1) Values are temperature dependent

1 Ordering and packaging information

Table 1 Ordering information

Type	Package	User Memory	Words	Ordering code
SRF 66V01ST C	Die (sawn/unsawn wafer)	114 bytes	57	on request
SRF 66V01ST NB	NiAu Bumps (sawn wafer)			on request

For more ordering information like wafer thickness or height of NiAu Bumps please contact your local Infineon sales office.

1.1 Pin description
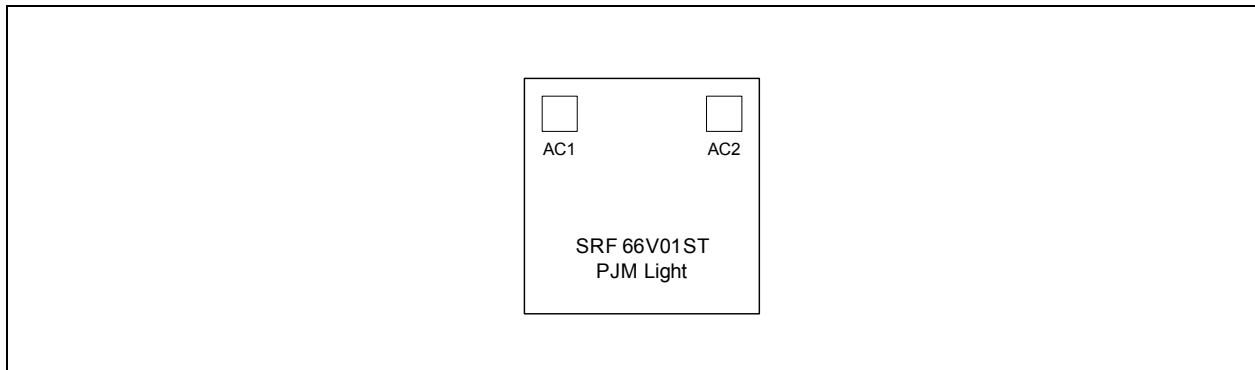
Figure 1 Pin configuration die

Table 2 Pin description and function

Symbol	Function
AC1	Antenna connection
AC2	Antenna connection

2 SRF 66V01ST PJM Light

The PJM Light is a high performance Radio Frequency Identification (RFID) Chip based on ISO/IEC 18000-3 Mode 2 dedicated for object identification applications. Its command set is optimized for fast identification and operation of large tag populations. High data rate commands are enabled through the use of Phase Jitter Modulation (PJM) techniques. This high communication speed combined with eight reply channels in parallel and highly reliable object detection enable high performance system setups. The implementation enables the operation on tags which are closely stacked which includes systems for document management, supply chain management and health care applications.

For ease of system migration, the PJM Light is fully compatible with the 10 kbit EEPROM SRF 66V10ST. Applications working with the SRF 66V10ST which are using user memory not exceeding the SRF 66V01ST user memory can switch to the PJM Light without system modifications.

On the other hand PJM Light applications with rising memory demands can be shifted to the SRF 66V10ST chip taking into account the different command set.

The PJM Light complies with and is an enhancement of the ISO/IEC 18000-3 Mode 2 standard. This document does not describe the functionality specified in the ISO standard. For system integration this data sheet has to be read in combination with the relevant ISO standards, see ISO/IEC 18000-3 Mode 2.

2.1 Circuit Description

The following diagram shows the main blocks of the PJM Light.
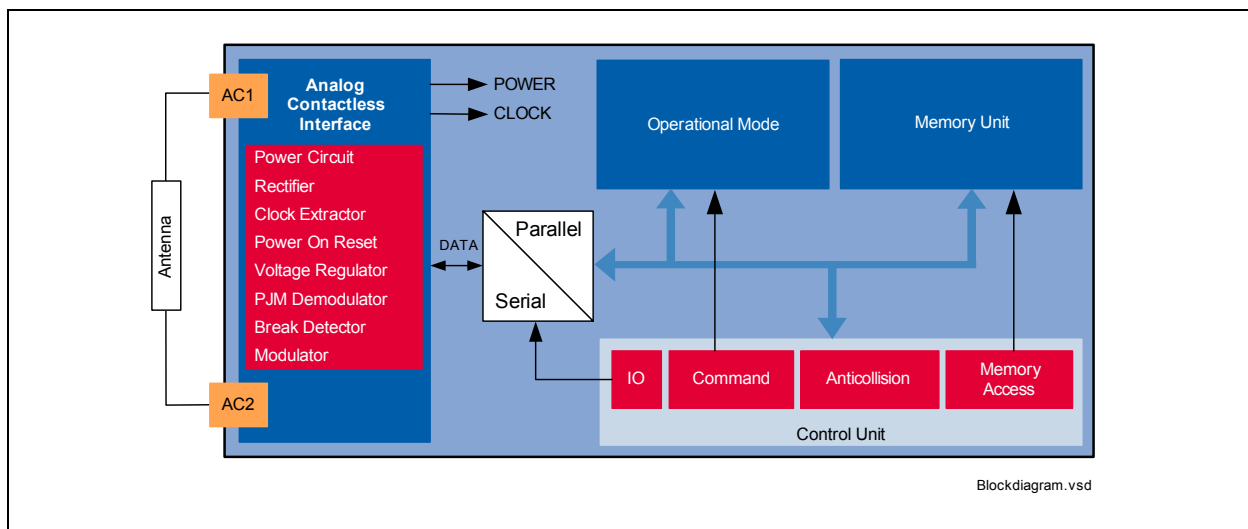
Figure 2   Block Diagram of the PJM Light

- **Analog Contactless Interface**
  - The Analog Contactless Interface comprises the voltage rectifier, voltage regulator and system clock recovery to supply the IC with appropriate power and clock. Additionally this block demodulates command data and modulates reply data.
- **Operational Mode**
  - The memory access is controlled by commands sent to the PJM Light and the chip configuration such as Password or Lock Pointer.
- **Memory Unit**
  - The Memory Unit consists of 80_D words organized in 20_D pages each of 4 words each (word size 16 bits).
- **Control Unit**
  - The Control Unit decodes and executes all commands. Additionally the control unit is responsible for the correct anticollision flow.

2.2 Memory Principle

The memory organization of the PJM Light is compliant to ISO/IEC 18000-3 Mode 2. It is split into Manufacturing System Memory, User System Memory, User Memory and the Configuration and System Memory.
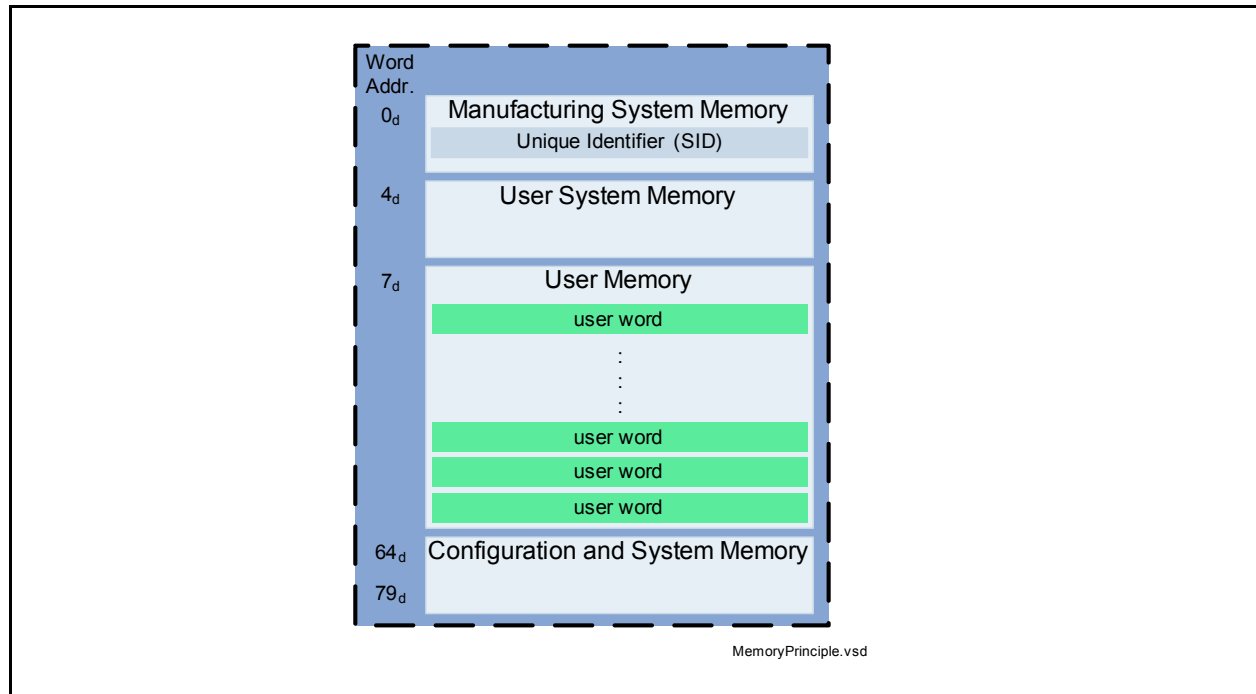

Figure 3 **Memory Principle**

- **Manufacturing System Memory**
  – contains the unique identifier (SID - Specific IDentifier) and manufacturing data
  – information stored in this memory area cannot be changed
- **User System Memory**
  – contains the Application Group Identifier, the Conditional Identifier and the Configuration Word
- **User Memory**
  – contains the Password in the first 3 words if this feature is enabled
  – stores user data in memory words
- **Configuration and System Memory**
  – contains chip internal configuration data, the System Configuration Word and the Lock Pointer
  – the Lock Pointer can be accessed using a special read/write command
  – the System Configuration Word can be accessed using a separate command

2.3 System Description

The system consists of a contactless label with an antenna and the PJM Light chip attached and a contactless PJM reader together with an antenna. The label antenna is a simple coil made with a few turns. Contactless labels are passive - meaning that they are powered by the field generated by the reader. Data is exchanged with data rates up to 424 kbit/s.

An intelligent anticollision function enables the operation of more than one label in the field simultaneously. The anticollision algorithm selects each label individually and ensures that the execution of a transaction with a selected label is performed without data corruption caused by other labels.
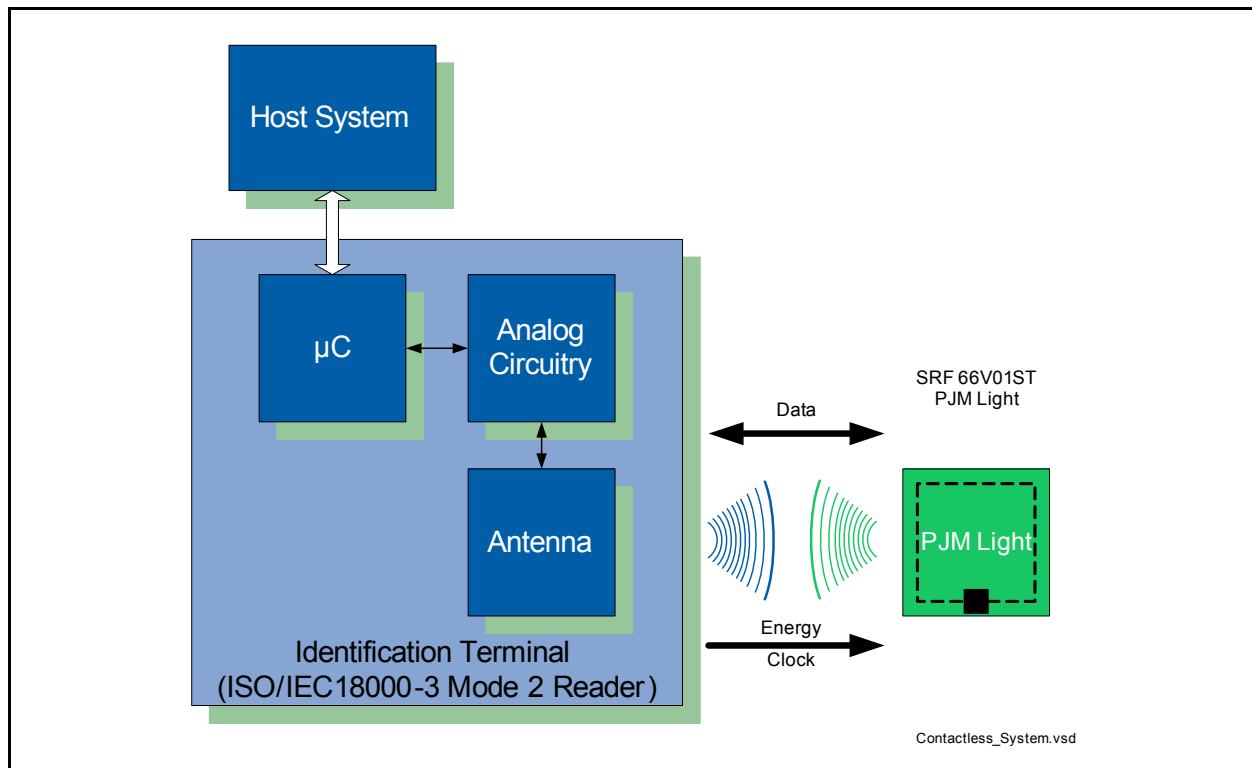

Figure 4   Contactless System Description

2.4 Chip Features

The PJM Light has to be seen as a part of a label-interrogator system. It features reliable high-speed identification with multiple tags simultaneously present within the reader operating volume.

- The readers can identify over 32,000 tags all simultaneously present within the reader even when the tags are closely stacked.
- An example identification rate is 150 tags in 100 ms.

Differentiation between application groups can be achieved via a user defined Application Group Identifier stored in chip memory. This ensures rapid identification of tags in open systems where there is no control over the population of tags within a reader. Selecting one group of tags with a specific Application Group Identifier leaves all tags from other application groups silent, therefore reducing the total number of tags communicating with the reader which improves the read rate and reliability. If required, readers can command all present tags to reply irrespective of their application group.

At chip manufacture a unique Specific Identifier (SID) is stored in the memory of the chip which allows individual tags to be identified and addressed when multiple tags are simultaneously present within a reader.

Furthermore, identification and addressing of tags is possible via a conditional test conducted on a user defined Conditional Identifier stored in chip memory. The chip rejects commands if the Conditional Identifier stored in chip memory is less than the Conditional Identifier supplied in the command. For example, this feature can be used like a date-code to communicate only to tags whose date-code is higher than the value supplied with the command.

The memory of the chip can be selectively read and written as fully buffered words. It is lockable, which effectively prevents selected memory areas from being overwritten. The PJM Light can be configured to be password protected, preventing unauthorized writes to memory. A special Password Protected Read provides an authentication mechanism without the need of writing to the memory.

The communication speed from the reader to the tag is at a data rate of 424 kbit/s. Chips reply on one of eight channels at a data rate of 106 kbit/s or 424 kbit/s. At 106 kbit/s readers are able to receive multiple tags using different reply channels simultaneously. For fast identification rate, a pseudo-random channel hopping is available which chooses one of the eight channels for transmitting the chip reply. Furthermore, chips can be temporarily muted to speed up the identification of multiple tags.

2.5 Determination of the Chip Type

To identify the different types of PJM contactless memories, the ISO/IEC 18000-3 Mode 2 defines Hardcode Words. If present, they override the default memory organization and indicate optional functionality. The Hardcode Words are included in normal chip replies.

The memory size and organization as well as the programming time of the PJM Light are meeting the default tag parameters defined in ISO/IEC 18000-3 Mode 2. Only additional functionality included in the PJM Light is described in one special function Hardcode Word with value $E805_H$. The features described in this Hardcode Word are:

• ECC status
• SYSCFG
• Short Mute, Short Read, Select, Password Protected Read, Queue and Execute Now, High Speed Reply, Timed Wakeup and '1 out of 4' all available

2.6 Supported Standards

The PJM Light chip is compliant with ISO/IEC 18000-3 Mode 2. The commands set defined in this standard is implemented by this chip. Additionally, custom commands are implemented to support fast identification and operation.

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