SHORT FORM SPECIFICATION

SL3ICS30 01
UCODE HSL

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1 DESCRIPTION

The UCODE HSL IC (UCODE High frequency Smart Label) is a dedicated chip for passive, intelligent tags and labels, especially for supply chain management and logistics applications in the US, where operating distances of several meters can be realized. Further, the UCODE HSL technology platform is also designed for operation under European regulations.

This integrated circuit is the first member of a product family of smart label ICs targeted to be compliant with the future ISO standards 18000-4 and 18000-6 for item management.

The UCODE system offers the possibility of operating labels simultaneously in the field of the reader antenna (Anticollision, Collision Arbitration).

The UCODE HSL family of ICs is especially designed for long range applications.

The tag requires no internal power supply. Its contactless interface generates the power supply via the antenna circuit by propagative energy transmission from the interrogator (read/write device), while the system clock is generated by an on-board oscillator. The contactless interface demodulates data transmitted from the interrogator to the UCODE HSL based tag, and further modulates the electromagnetic field provided by the interrogator for data transmission from the UCODE HSL based tag to the interrogator.

1.1 Contactless Energy and Data Transfer

Whenever connected to a dedicated antenna for the targeted frequency range, the UCODE HSL can be operated without the line of sight and without the need of a battery on the tag. When the smart label or tag is within the operating range of the interrogator (read/write device), the high speed radio frequency communication interface allows to transmit data in both directions.

The maximum typical operating distances depend on local regulations and the used frequency band.

Table 1: Operating distances for UCODE HSL based tags and labels in released frequency bands.

FREQUENCY RANGE	REGION	AVAILABLE POWER	CALCULATED READ DISTANCE SINGLE ANTENNA[8,9]
869.4 – 869.65 MHz (UHF)	Europe[1]	0.5 W ERP	4.0 m
865.5 – 867.6 MHz (UHF)	Europe[2]	2 W ERP	8.0 m
902 – 928 MHz (UHF)	America[3]	4 W EIRP	8.4 m
860 – 960 MHz (UHF)	Others[4]		
2.400 GHz – 2.4835 GHz	Europe[5]	0.5 W EIRP outdoor	0.6 m
2.400 GHz – 2.4835 GHz	Europe[5]	4 W EIRP indoor	1.8 m
2.400 GHz – 2.4835 GHz	America[6]	4 W EIRP	1.8 m
2.400 GHz – 2.4835 GHz	Others[7]		

Notes:
1)   Current CEPT/ETSI regulations: CEPT REC 70-03 Annex 1, ETSI EN 330 220-1
2)   Proposal for future CEPT/ETSI regulations
3)   FCC regulations, Part 15 Section 247
4)   In many other countries regulations either similar to FCC or CEPT/ETSI may apply.
5)   Current CEPT/ETSI regulations: CEPT REC 70-03 Annex 11, ETSI EN 330 440-1
6)   FCC regulations Part 15 Section 247
7)   In many other countries regulations either similar to FCC or CEPT/ETSI apply.
8)   These distances are typical values for general tags and labels. A special tag antenna design could achieve higher values.

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9)   Practical useable read distance values may be notable lower, strongly depending on application set-up, damping by environment materials and the quality of the matching between tag antenna and chip impedance.

1.2 Collision Arbitration, Anticollision

An intelligent collision arbitration function allows operating more than one label in the filed simultaneously. The aniticollision algorithm selects each tag individually and ensures that the execution of a transaction with a selected tag is performed correctly without data corruption resulting from other tags in the field.

1.3 Data Integrity

The following mechanisms are implemented in the contactless communication link between the interrogator and the tag ensure very reliable data transmission:

- 16 bit CRC
- Bit count checking
- Bit coding to distinguish between "1", "0" and no information
- Channel monitoring (protocol sequence and bit stream analysis)

1.4 Air Interface Standards

The SL3ICS30 is fully supporting standardization on air interfaces. The SL3ICS30 is targeted to be compliant with the following air interfaces:

- ISO/IEC 18000-4 – Information Technology - Radio Frequency Identification (RFID) for Item Management – Part 4: Parameters for Air Interface Communications at 2.45 GHz

- ISO/IEC 18000-6 – Information Technology - Radio Frequency Identification (RFID) for Item Management – Part 6: Parameters for Air Interface Communications at 860 - 930 MHz

- ANSI/INCITS 256-2001 – Radio Frequency Identification (RFID) Part 3 - 2.45 GHz

- ANSI/INCITS 256-2001 – Radio Frequency Identification (RFID) Part 4 - UHF

1.5 Application Standards

The SL3ICS30 is also fully supporting application standardization. The SL3ICS30 is targeted to be compliant with the following application standards:

- MH10.8.4 – Radio Frequency Identification for Returnable Containers and Cable Reels

- AIAG B-11 – Automotive Tire and Wheel Label Radio Frequency (RFID) Identification Standard

- EAN.UCC GTAG™ – Radio Frequency Identification (RFID) Performance Standards Initiative

- ISO 18185 – Freight Containers -Radio-frequency communication protocol for electronic seal

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1.6 Supported Commands

1.6.1 Selection Commands

GROUP_SELECT_EQ, GROUP_SELECT_NE, GROUP_SELECT_GT, GROUP_SELECT_LT

GROUP_UNSELECT_EQ, GROUP_UNSELECT_NE, GROUP_UNSELECT_GT, GROUP_UNSELECT_LT

GROUP_SELECT_EQ_FLAGS, GROUP_SELECT_NE_FLAGS

GROUP_UNSELECT_EQ_FLAGS, GROUP_UNSELECT_NE_FLAGS

MULTIPLE_UNSELECT

1.6.2 Identification Commands

FAIL, SUCCESS, RESEND, INITIALIZE

1.6.3 Data Access

DATA_READ, READ, READ_PORT, READ_VARIABLE,

WRITE, WRITE_MULTIPLE, WRITE4BYTE, WRITE4BYTE_MULTIPLE

LOCK, QUERY_LOCK, READ_VERIFY, READ_VERIFY_4BYTE

1.7 Memory Organization

The 2048 bit EEPROM memory is grouped in UID memory, user memory and lock information. A byte is the smallest access unit. All bytes can be addressed by read and write commands.

1.7.1 Write Access Conditions

Each byte in the user memory can be write protected individually. Write protected blocks can never be written again.

1.7.2 Serial Number

Serial numbers, which can not be altered, guarantee the uniqueness of each label.
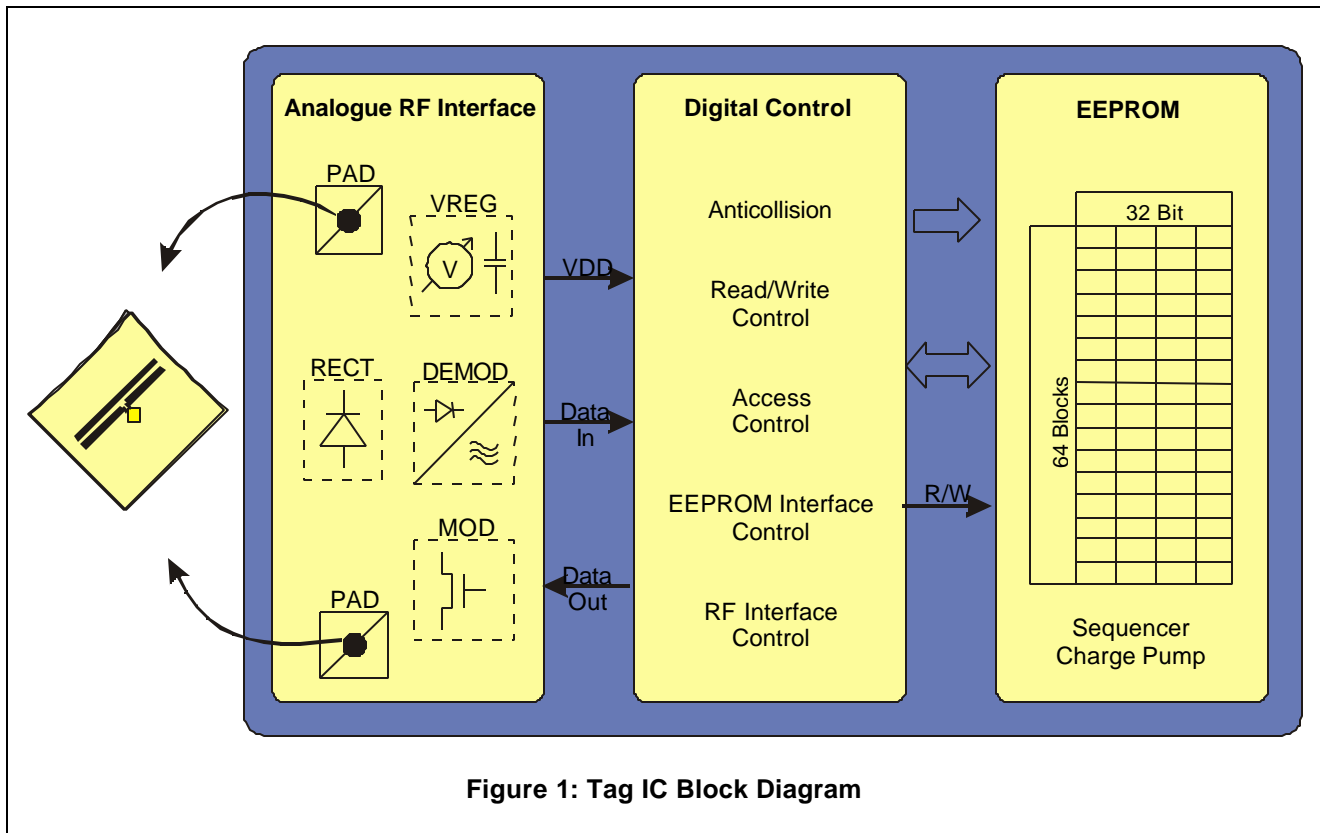
1.7.3 Configuration of delivered ICs

UCODE HSL ICs are delivered with the following configuration from Philips:

- Serial number is unique and read only
- Write Access conditions allow changing all bytes except those containing the serial number
- User data memory is not defined

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2 BLOCK DIAGRAM

Figure 1: Tag IC Block Diagram

3 FEATURES

3.1 RF Interface

- Contactless transmission of data and supply energy (no battery needed)

- Operating distance, depending on antenna geometry and local regulations, up to 8.4 m for a single antenna.

- Operating frequency within the released operating bands from 860 MHz to 960 MHz and 2.4 GHz to 2.5 GHz.

- High data integrity: 16 bit CRC, framing

- True aniticollision for collision arbitration

- Write distance 70% of reading distance

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3.2 Memory

* 2048 bits

* 64 bits UID in memory bytes 0 to 7.

* 216 bytes with user definable access conditions for memory bytes 8 to 223

* Data retention of 10 years

* Write endurance of 100 kcycles

3.3 Security

* Unique serial number for each device

* Lock mechanism (write protection) for each byte.

4 ORDERING INFORMATION

Table 2: Ordering Information

ORDERING NAME	ORDERING CODE	OPTIONAL DESCRIPTION
SL3ICS30 01 FW/V4	9352 740 15005	Bumped, sawn wafer on FFC, 150 µm, inked and mapped
SL3S30 01FTT	9352 741 69118	Packaged die in TSSOP8 package

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