Description

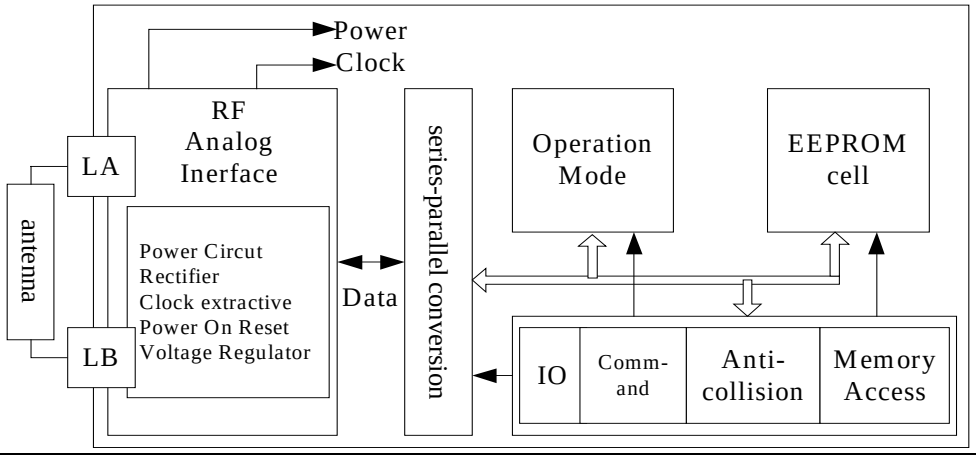
The BL75R05 IC is a dedicated chip for intelligent label applications like supply chain management as well as baggage and parcel identification in airline business and mail services. The BL75R05 is designed for long range applications. BL75R05 IC can be operated without line of sight up to a distance of 60cm (gate width). No battery is needed. When the smart label is positioned in the field of an interrogator antenna, the high speed RF communication interface allows to transmit data with up to 53kbit/s. An intelligent anti-collision function allows to operate more than one tag in the field simultaneously. Unique Identifiers, which can not be altered, guarantee the uniqueness of each label.

Features

- RF Interface (ISO/IEC 15693 compliant)
- Contact-less transmission of data and supply energy (no battery needed)
- Operating distance: up to 60cm (depending on antenna geometry)
- Operating frequency: 13.56 MHz
- Fast data transfer: up to 53 kbit/s
- High data integrity: 16 Bit CRC, framing
- True anti-collision
- Electronic Article Surveillance (EAS)
- Application Family Identifier (AFI) supported
- Data Storage Format Identifier (DSFID)
- Additional fast anti-collision read
- Write distance equal to read distance
- 1024 bits EEPROM, organized in 32 blocks of 4 byte each
- Data retention of 10 years
- Write endurance 100.000 cycles
- Unique identifier for each device
- Lock mechanism for each user memory block (write protection)
- Lock mechanism for DSFID, AFI, EAS

Functional Description

Block Diagram



The label requires no internal power supply. Its contactless interface generates the power supply and the system clock via the resonant circuitry by inductive coupling to the interrogator. The interface also demodulates data that are transmitted from the interrogator to the Label, and modulates the electromagnetic field for data transmission from the Label to the interrogator. Data are stored in a non-volatile memory (EEPROM). The EEPROM has a memory capacity of 1024 bit and is organised in 32 blocks consisting of 4 bytes each (1 block = 32 bits).

Memory Organization

	Byte 0	Byte 1	Byte 2	Byte 3	
Block –4	UID0	UID1	UID2	UID3	Unique Identifier (lower bytes)
Block –3	UID4	UID5	UID6	UID7	Unique Identifier (higher bytes)
Block –2	Internally used	EAS	AFI	DSFID	EAS, AFI, DSFID
Block –1	00	00	00	00	Write Access Conditions
Block 0	x	x	x	x	User Data
Block 1	x	x	x	x	
	⋮	⋮	⋮	⋮	
Block 26	x	x	x	x	
Block 27	x	x	x	x	User Data

EEPROM memory organization

The values (in hexadecimal notation) shown in the table above are stored in the EEPROM after the wafer production process. The contents of blocks marked with 'x' in the table are not defined at delivery. With read and write commands only blocks 0 to 27 can be addressed.

1 UNIQUE IDENTIFIER

The 64 bit unique identifier (UID) is programmed during the production process according to ISO/IEC 15693-3 and cannot be changed afterwards.The numbering of the 64 bits is done according to ISO/IEC 15693-3 starting with the LSB 1 and ending with the MSB 64. This is in contrast to the general used bit numbering within a byte.

MSB LSB

64 57	56 49	48 41	40 1				
"E0"	RegNo	"01"	IC manufacturer serial number				
UID 7	UID 6	UID 5	UID 4	UID 3	UID 2	UID 1	UID 0

2 EAS FUNCTION

The LSB of Byte 1 in Block –2 holds the EAS bit (Electronic Article Surveillance mode active → the label responds to an EAS command)

Block -2，Byte 1							
MSB							LSB
X	X	X	X	X	X	X	e
							EAS

EAS: e = 1 → EAS enabled e = 0 → EAS disabled

3 AFI

The label system offers the feature to use an Application Family Identifier (AFI) at the *inventory* command ant the two custom commands ***inventory read*** and ***fast inventory read*** (this allows for example the creation of 'label families'). This 8-bit value is located at Byte 2 in Block -2 as shown in the following figure and is only evaluated if the AFI flag is set in the reader command. For details please refer to ISO 15693-3.

Block -2，Byte 2							
MSB							LSB
X	X	X	X	X	X	X	e
AFI							

4 DSF ID

The Data Storage Format Identifier (DSFID) is located at Byte 3 in Block –2.
For details please refer to ISO/IEC 15693-3.

Block -2，Byte 3							
MSB							LSB
X	X	X	X	X	X	X	e
DSFID							

5 WRITE ACCESS CONDITIONS

The Write Access Condition bits in block -1 determine the write access conditions for each of the 28 user blocks and the special data block. These bits can be set only to 1 with a lock command (and never be changed back to 0), i.e. already write protected blocks can never be written to from this moment on.

	Block -1															
	Byte 0								Byte 1							
	MSB							LSB	MSB							LSB
block number	3	2	1	0	-2.3	-2.2	-2.1	-2.0	11	10	9	8	7	6	5	4
	Byte 2								Byte 3							
	MSB							LSB	MSB							LSB
block number	19	18	17	16	15	14	13	12	27	26	25	24	23	22	21	20

Communication Principle

For detailed description of the protocol and timing please refer to ISO/IEC 15693-2 (modulation, bit-coding, framing) and 15693-3 (anti-collision, timing, protocol).

Supported Commands

1 MANDATORY COMMANDS

a. Inventory

As defined in ISO/IEC 15693-3.

b. Stay quiet

As defined in ISO/IEC 15693-3.

2 OPTIONAL COMMANDS

a. Read single block

As defined in ISO/IEC 15693-3. Option 0 is supported. Option 1 is supported.

b. Write single block

As defined in ISO/IEC 15693-3. Only Option 0 is supported.

c. Lock block

As defined in ISO/IEC 15693-3. Only Option 0 is supported.

d. Read multiple blocks

As defined in ISO/IEC 15693-3. Option 0 is supported. Option 1 is supported.

e. Select

As defined in ISO/IEC 15693-3.

f. Reset to ready

As defined in ISO/IEC 15693-3.

g. Write AFI

As defined in ISO/IEC 15693-3. Only Option 0 is supported.

h. Lock AFI

As defined in ISO/IEC 15693-3. Only Option 0 is supported.

i. Write DSFID

As defined in ISO/IEC 15693-3. Only Option 0 is supported.

j. Lock DSFID

As defined in ISO/IEC 15693-3. Only Option 0 is supported.

k. Get system information

As defined in ISO/IEC 15693-3.

l. Get multiple block security status

As defined in ISO/IEC 15693-3.

3 CUSTOM COMMANDS

a. Inventory read

As defined in ISO/IEC 15693-3 Option 0 is supported. Option 1 is supported.

b. Inventory Write

As defined in ISO/IEC 15693-3 Only Option 0 is supported.

c. Fast inventory read

As defined in ISO/IEC 15693-3

d. Set EAS

As defined in ISO/IEC 15693-3

e. Reset EAS

As defined in ISO/IEC 15693-3

f. Lock EAS

As defined in ISO/IEC 15693-3

g. EAS Alarm

As defined in ISO/IEC 15693-3

Electrical Specification

1 Absolute Maximum Ratings

Symbol	Parameter	Test Conditions	Rating	Unit
Tstg	Storage Temperature Range		-55 To +140	℃
Tj	Junction Temperature		-55 To +140	℃
Vesd	Esd Voltage Immunity	-Std-883d	±2	KVpeak
Imaxla-Lb	Maximum Input Peak Current		±60	mA Peak

2 Operating Conditions

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
Tamb	Operating Ambient Temperature		-25		+70	℃
Tjop	Operating Junction Temperature		-25		+85	℃
Ila-Lb	Input Current				30	mArms
Vla-Lbrd	Minimum Supply Voltage For Read/Eas	Standard Mode		±3.1	±3.7	Vpeak
Vla-Lbwr	Minimum Supply Voltage For Write	Standard Mode		±3.6	±3.7	Vpeak
Fop	Operating Frequency		13.553	13.560	13.567	MHz

3 Electrical Characteristics

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
Cres	Input Capacitance Between La-Lb	Vla-Lb=2vrms	22.3	23.5	24.7	Pf
Pmin	Minimum Operating Supply Power	Vla-Lb=2vrms		200		μ W
Mmin	Minimun Modulation Of Rf Voltage For Demodulator Response	M=(Vmax-Vmin) /(Vmax+Vmin)		10	100	%
Mmax	Maximun Modulation Of Rf Voltage For Demodulator Response	M=(Vmax-Vmin) /(Vmax+Vmin)	30			%
tpsm	Modulation Pulse Length of RF Voltage	m ≥ 10%	7.08	9.44	11.8	μS
tD	Demodulation Response Time	m ≥ 10%	0.1	0.8	2.4	μS
Rmod	Modulator ON Retention	ILA-LB=30mA	50	115	250	Ω
Tret	Eeprom Data Retention	Tamb≤ 55 °C	10			Years
Nwrite	Eeprom Write Endurance		10^5			Cycles