# **Atmel**

# **APPLICATION NOTE**

Using Atmel ATA5577 in Animal Identification Application according to ISO11784/85

## ATAN0086

#### General

The Atmel<sup>®</sup> ATA5577 is the successor of the Atmel T5551, Atmel T5557 and Atmel ATA5567 with improved analog front-end circuitry and increased functionality. A basic mode is implemented being backward compatible in most common modes to existing Atmel T5551 (in most common modes), Atmel T5557 and Atmel ATA5567 applications.

To achieve a high flexibility on assembly the chip is offered in various versions differing by package, by the internal chip capacitance and two types of pads: standard pads and mega pads for direct coil mounting.

# 1. Application

This application note describes the antenna adaptation and programming of the Atmel<sup>®</sup> ATA5577 to be compliant with ISO standard 11784/85 for animal ID and waste management applications.

Note: For detailed information in terms of functionality and packaging please refer to the Atmel ATA5577 datasheet.

## 1.1 Example of Animal ID Tag

Figure 1-1. E-unit to be Used for Ear Tags



#### 1.1.1 Tag Parameters

#### Chip version:

Atmel ATA5577M1330 Capacitor on chip 330pF ±3pF

#### Antenna Parameters at 134.2kHz:

Resistance	R = 70Ω
Quality factor	Q = 48
A	

#### Antenna Size:

Diameter external	28mm
Diameter internal	22mm
Thickness	1.5mm

#### 1.2 Tag Programming to Achieve ISO 11784/85 Compliance

The standardization of animal identification via radio frequency (RFID) is described by the ISO standards 11784 and 11785. ISO11785 specifies how a transponder is activated and how the stored information is transferred to a transceiver, while

ISO11784 defines the structure and the information content of the codes stored in the transponder.

#### 1.2.1 Requirements for Compliance with ISO11785

- Atmel LF RFID systems must operate in FDX-B mode, modulating the magnetic field by ASK
- The transceiver carrier frequency and the resonant frequency of the transponder have to be adjusted to typically 134.2kHz ±3kHz.
- The data coding transferred by the transponder must be performed by differential biphase (DBP)
- The data bit rate is specified as RF/32



#### 1.2.2 Telegram Structure as Defined by ISO11784

The graph below shows the 128-bit code structure to be implemented within the 128-bit tag telegram. A header of 11 bits is used to identify the start of the telegram. The identification code is sent in 8 blocks. Each block of 8 bits is trailed by a control bit with a value of logical 1, which is needed to prevent the header from occurring again in the rest of the telegram.

Other than the header, each field of the code structure is transmitted starting with the LSB and ending with the MSB.

The 16-bit CRC detection code is calculated solely over the 64-bit identification code by using the CRC-CCIT algorithm (described in ISO11785 Annex B).

#### Figure 1-2. Structure of the FDX Identification Telegram

Header	LSB	l	dentificatio	on Code	64 bits + 8	3 control b	oits			ts CRC ntrol bits	24 bi	Trailer ts + 3 trail	bits MSB
11 bits	8 bits	8 bits	8 bits	8 bits	8 bits	8 bits	8 bits	8 bits	8 bits	8 bits	8 bits	8 bits	8 bits
1 11	12 /	21	30	39	48	57	66	75	84	93	102	111	120 128

Control bit

#### Table 1-1. ISO11784 Code Structure

Information		Bit No.	Description
11-bit header		1 to 11	Identification of telegram start
	38 + 4 bit national code	12 to 53	Unique number within country, controlled by ICAR database
64-bit	10 + 2 bit country code	54 to 65	Defined by ISO3166
identification code	1-bit flag	66	Identifies if additional data are appended
+ 8 trail bit	14 + 1 bit reserved	67 to 81	Reserved for future use
	1 + 1 bit flag	82 to 83	Distinguish between animal and non-animal applications
16 bit + 2 bit C	RC detection	84 to 100	Computed 16-bit CRC code using CRC-CCIT algorithm
24 bit + 3 bit e	xtension	101 to 128	Data content, if indicated by flag (bit number 66)

Except the header, each field of the code has to be sent LSB first. Accordingly, the related bit steam has to be written into the data blocks below with respect to the bit order. The 16-bit CRC detection code is calculated solely over the 64-bit identification code by using the CRC-CCIT algorithm.

# 2. Transforming the ISO Telegram Structure to the ATA5577 Memory Map

## 2.1 Tag Configuration by Block 0

- Data rate RF/32
- Data coding Differential Biphase (DBP)
- Lock bit "1"
- Code length MAXBLK 4

Note: Verify that the data content is correct before setting the Lock bit

#### Table 2-1. Structure of Block 0 Setting

```
Block Lock
```

```
No. Bit
```

	Order	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
0	HEX	1		6	3			(	)			3	3			F	-			8	3			(	)			8	3			(	)	
	BIN	1	0	1	1	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0

## 2.2 Example of ATA5577 Memory Map to Be Compliant with ISO Standard

In the example below, data blocks 1 through 4 are programmed according to the standard with the settings as specified by Figure 2-1.

#### Figure 2-1. Example of Code Programming

Information		Example of Data Content					
11-bit header		00000000001 (binary)					
64-bit	38 + 4 bit National Code	1					
identification	10 + 2 bit Country Code (according to ISO3166)	999 (decimal) (code for test purposes)					
code + 8 trail	1 bit data block	0					
bits	14 + 1 bit reserved code	0					
DILS	1 +1 bit animal	1					
16 bit + 2 bit (	CRC detection	0010 1110 0100 0100 (binary)					
24 bit + 3 bit e	extension	0					

Note: Except the header, each field of the code has to be sent LSB first. Accordingly, the related bit steam has to be written into the data blocks below with respect to the bit order. The 16-bit CRC detection code is calculated solely over the 64-bit identification code by using the CRC-CCIT algorithm.



#### Figure 2-2. Content of ATA5577 Memory – Example

Blo No.		.ock Bit	-																															
	Order	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
1	HEX	1		C	)			(	)			3	3			(	)			1	1			C	)			(	0			8	3	
	BIN	1	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0		0	0	0
Te	legr. orde	er	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
	Order	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
2	HEX	1		C	)			4	4			(	)			:	2			(	)			7	7			9	9			F	:	
	BIN	1	0	0	0	0	0		0	0	0	0	0	0	0	0		0	0	0	0	0	0	1	1		1	0	0	1	1	1	1	1
Te	legr. orde	er	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64
	Order	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
3	HEX	1		8	3			(	)			4	1			(	)			(	3			2	1			;	5			7	,	
	BIN	1		0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	1		0	0	1	0	0	0	1	0		0	1	1	1
Te	legr. orde	er	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96
	Order	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
4	HEX	1		4	l I			8	3			(	)			4	Ļ			(	)			2	2			(	0			1		
	BIN	1	0	1	0	0		0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	
Te	legr. orde	er	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128

Atmel

# 3. Test Sample Programming and Reading via Atmel ATA2270-EK2 RFID Kit

This new generation kit allows programming of sample tags. This can be achieved in stand-alone mode using the on-board buttons, joystick and display or through a PC GUI dedicated to ISO11784/785 applications.

#### Figure 3-1. ATA2270-EK2: Display Shows Animal Programming Mode, Below Are the Keys

Write Animal ID AnimaleYes Data:No Country:03E7 (999d) ational:0040632371 RC:273E 🗸



Figure 3-2. Atmel ATA2270-EK2 Graphical User Interface, Example for Atmel ATA5577

ISO 11784/7	/85			6		
ISO11784/	785 Write			0.08,50		
Animal	Country Code (dec)	National Code (dec)				luto Increment [
Data	999		1		Lock	Send to Tag
ISO11784/	785 Read Comple	ete Structure				
🗌 Animal	Country Code (dec)	National Code (dec)		CRC (hex)	CRC Correct verified	Rd -> Wr
International Contractor					Ц	Read from Tag
Read Log I	File					
Read Log I	file					

Note: This Kits allows to program Animal compatible tags for testing purposes. It is not allowed to put them into the market. For commercial use, tags need an approval in terms of performance and uniqueness of the national ID code number covered by ICAR and national regulation. This Kit does not lock the tag blocks. It is intended only to create samples.

6 ATAN0086 [APPLICATION NOTE] 9114C-RFID-04/15



# 4. Revision History

Please note that the following page numbers referred to in this section refer to the specific revision mentioned, not to this document.

Revision No.	History
9114C-RFID-04/15	Put document in the latest template

# Atmel Enabling Unlimited Possibilities®



Т

Atmel Corporation

1600 Technology Drive, San Jose, CA 95110 USA

T: (+1)(408) 441.0311

F: (+1)(408) 436.4200

www.atmel.com

© 2015 Atmel Corporation. / Rev.: 9114C-RFID-04/15

Atmel<sup>®</sup>, Atmel logo and combinations thereof, Enabling Unlimited Possibilities<sup>®</sup>, and others are registered trademarks or trademarks of Atmel Corporation in U.S. and other countries. Other terms and product names may be trademarks of others.

DISCLAIMER: The information in this document is provided in connection with Atmel products. No license, express or implied, by estoppel or otherwise, to any intellectual property right is granted by this document or in connection with the sale of Atmel products. EXCEPT AS SET FORTH IN THE ATMEL TERMS AND CONDITIONS OF SALES LOCATED ON THE ATMEL WEBSITE, ATMEL ASSUMES NO LIABILITY WHATSOEVER AND DISCLAIMS ANY EXPRESS, IMPLIED OR STATUTORY WARRANTY RELATING TO ITS PRODUCTS INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTY OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, OR NON-INFRINGEMENT. IN NO EVENT SHALL ATMEL BE LIABLE FOR ANY DIRECT, INDIRECT, CONSEQUENTIAL, PUNITIVE, SPECIAL OR INCIDENTAL DAMAGES (INCLUDING, WITHOUT LIMITATION, DAMAGES FOR LOSS AND PROFITS, BUSINESS INTERRUPTION, OR LOSS OF INFORMATION) ARISING OUT OF THE USE OR INABILITY TO USE THIS DOCUMENT, EVEN IF ATMEL HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. Atmel makes no representations or warranties with respect to the accuracy or completeness of the contents of this document and reserves the right to make changes to specifications and products descriptions at any time without notice. Atmel does not make any commitment to update the information contained herein. Unless specifically provided otherwise, Atmel products are not suitable for, and shall not be used in, automotive applications. Atmel products are not intended, authorized, or warranted for use as components in applications intended to support or sustain life.

SAFETY-CRITICAL, MILITARY, AND AUTOMOTIVE APPLICATIONS DISCLAIMER: Atmel products are not designed for and will not be used in connection with any applications where the failure of such products would reasonably be expected to result in significant personal injury or death ("Safety-Critical Applications") without an Atmel officer's specific written consent. Safety-Critical Applications include, without limitation, life support devices and systems, equipment or systems for the operation of nuclear facilities and weapons systems. Atmel products are not designed nor intended for use in military or aerospace applications or environments unless specifically designated by Atmel as military-grade. Atmel products are not designed nor intended for use in automotive applications unless specifically designated by Atmel as automotive-grade.