

Features

- AES-128 Immobilizer Transponder for Use in Contactless Mode
- CMMI Certified. Configurable, Secure, Open Source Immobilizer Stack
- Energy Supply and Bi-directional Communication via LF Link (125 kHz)
- 32-bit Unique Identification Number
- Integrated Codecs for Enhanced LF Communication Range
- Fast AES-128 Cryptographic Engine for Both Immobilizer and RKE Functions
- Two 128-bit Secret Keys
- One 128-bit Transport Key
- Embedded Ultra-low-power Atmel® AVR® Microcontroller
- Fractional-N RF Transmitter Covering 315 MHz and 433 MHz
- 8-Kbyte Flash for User Application (6 Kbytes) and Immobilizer (2 Kbytes)
- 2112-byte EEPROM for User Data Storage (2 Kbytes) and Device Configuration (64 Bytes)
- Locking Mechanism Protects both Flash and EEPROM Contents
- Error Correction Code (ECC) Engine Protects both the Flash and EEPROM Units
- 1-wire Debug Interface Integrated with AVR Development Tools
- Automotive Grade C Compiler
- 1.9 to 3.6 V Battery Voltage Range (in Contact Mode)
- -40°C to +105°C Operating Temperature
- Small QFN 32 - 5x5 Package

1. Description

ATA5795 is a smart Remote Keyless Entry (RKE) device that includes an embedded ultra-low-power AVR 8-bit microcontroller, a fractional-N RF transmitter and an LF immobilizer interface in a single QFN32 package.

Furthermore, the device has an integrated AES-128 cryptography hardware engine, which is accessible by both the immobilizer and the RKE unit. The immobilizer interface can run in contactless mode, allowing energy supply and data transmission via the LF link.

The ATA5795 is designed for automotive applications that necessitate both immobilization and Remote Keyless Entry functions in one single key. It conforms to requirements of extremely low power consumption and provides all the necessary circuitry for the entire application.



Embedded AVR Microcontroller Including RF Transmitter and Immobilizer LF Functionality for Remote Keyless Entry

ATA5795

Summary

Preliminary

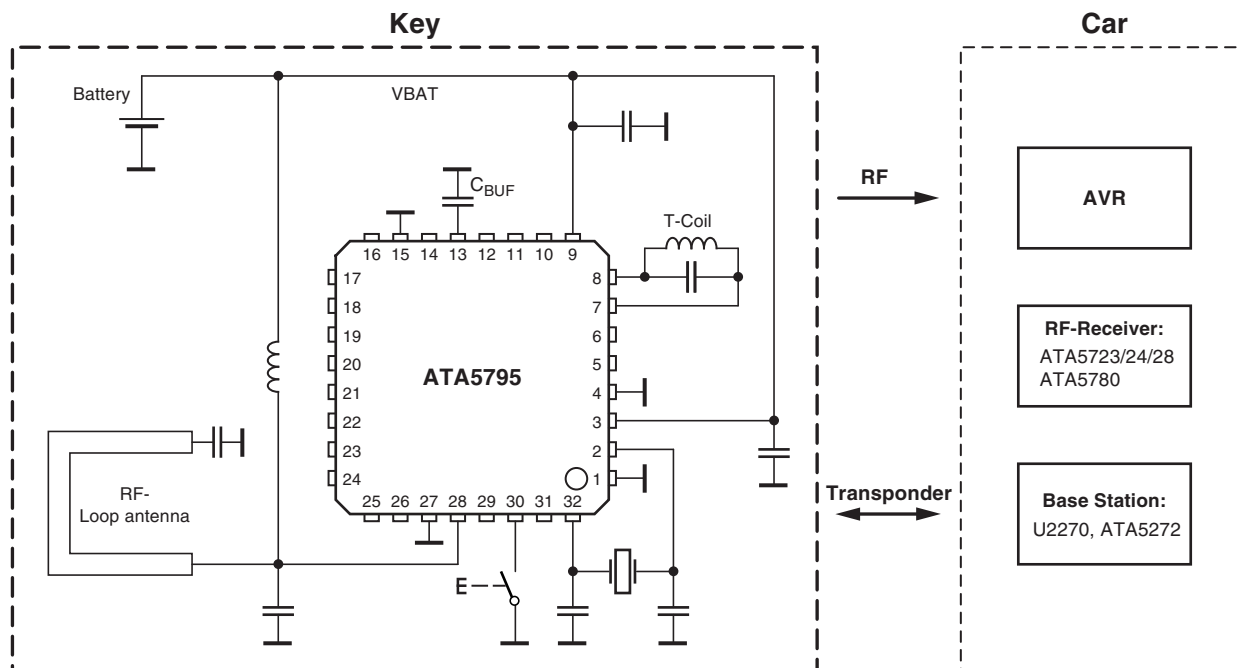
NOTE: This is a summary document. The complete document is available. For more information, please contact your local Atmel sales office.

9182AS-RKE-03/10



1.1 System Block Diagram

Figure 1-1. System Block Diagram



The block diagram illustrates the internal architecture of the AVR Core and its various peripheral components. The central component is the **AVR-Core**, which is connected to several peripheral blocks:

- Power Management**: Connected to the AVR-Core and external pins A4P and A4N.
- Contactless Interface/Transponder**: Connected to the AVR-Core and external pin PC0.
- Volt. Monitor**: Connected to the AVR-Core and external pin PD7/TM3.
- IR-Driver**: Connected to the AVR-Core and external pins PD6/TM2, PD5/TM1, and PD4/ECIN0.
- Timer Block**: Connected to the AVR-Core and external pins PD3, PD2/TEI, PD1/T3ICP, and PD0/INT0.
- Crypto Unit**: Connected to the AVR-Core and external pins XTAL2 and XTAL1.
- SPI**: Connected to the AVR-Core and external pin VBAT.
- EEPROM/2KB**: Connected to the AVR-Core and external pin VCC.
- RTC**: Connected to the AVR-Core and external pin VCC.
- FRC-Oscillator**: Connected to the AVR-Core and external pin VCC.
- Clock Management and Monitoring**: Connected to the AVR-Core, FRC-Oscillator, and external pin VCC. It also has an **ECIN** input from the Contactless Interface/Transponder.
- Watchdog Oscillator**: Connected to the AVR-Core and external pin VCC.
- Watchdog Timer**: Connected to the AVR-Core and external pin VCC.
- POR/BOD and Reset**: Connected to the AVR-Core and external pin VCC.
- IO-Ports**: Connected to the AVR-Core and external pin VCC.
- RF-Transmitter**: Connected to the AVR-Core and external pin VCC. It includes a **Frac.-N PLL**, **VCO**, and **Power Amplifier**.
- Digital Control**: Connected to the AVR-Core and external pin VCC.
- Debug-WIRE**: Connected to the AVR-Core and external pin VCC.
- CRC-Module**: Connected to the AVR-Core and external pin VCC.

The diagram also shows the connection of the AVR-Core to external pins: A4P, A4N, PC0, PD7/TM3, PD6/TM2, PD5/TM1, PD4/ECIN0, PD3, PD2/TEI, PD1/T3ICP, PD0/INT0, XTAL2, XTAL1, VBAT, VCC, VSRF, XT01, XT02, ANT1, ANT2, PB7, PB6, PB5/TM5, PB4/TM4, PB3/MISO, PB2/MOSI, PB1/SCK, PB0/NSS, GND, TME, NRESET(DW), and GNDRF.

2. Ultra-low-power AVR Microcontroller (ATA5795)

2.1 Features

2.1.1 High Performance, Ultra-low-power AVR 8-bit Microcontroller

Advanced RISC Architecture

- 131 Powerful Instruction
- 32×8 General Purpose Working Registers
- Fully Static Operation
- On-chip 2-cycle Multiplier

Non-volatile Program and Data Memories

- 8 Kbytes of In-System Self-Programmable Flash with ECC
- 2112 Bytes of EEPROM with ECC
- 512-byte Internal SRAM
- Programming Lock for Software Security

Peripheral Features

- Programmable Watchdog/Interval Timer with Separate Internal Calibrated Ultra-Low-Power Oscillator
- Two 8-bit Timer/Counters: 1x with Compare Mode, 1x with Compare and Capture Mode
- Programmable Automatic Data Codec
- Power Management for Power Supply
- High Performance AES-128 Hardware Crypto Unit
- CRC Module
- Programmable Voltage Monitor
- Infrared (IR) Driver Stage to Control an External IR Transmitter Stage
- System Clock Management and Clock Monitoring
- Master/Slave SPI Serial Interface
- Integrated DebugWire Interface
- Interrupt and Wake-up on Pin Change
- 32-bit Unique Device Identification Number

Analog Front End (AFE) and Power Management Features

- Integrated Power Management that Automatically Handles the Two Power-supply Sources (Battery or 125 kHz Magnetic Field)
- Contactless Interface for Power Supply and Bi-directional Data Communication

Special Microcontroller Features

- Power-on Reset and Brown-out Detection
- Two Internal Calibrated RC Oscillators
- Real Time Clock (RTC) Module with Integrated Ultra-low-power 32 kHz Crystal Oscillator Circuit
- External and Internal Interrupt Sources
- Several Sleep Modes: Idle, Extended Power-save, Power-save and Power-down

I/O and Package

- 17 Programmable I/O Lines
- Small QFN 32 - 5x5 Package

RF-Transmitter

- Fully Integrated Fractional-N PLL
- ASK and Closed Loop FSK Modulation
- Output Power up to +12.5 dBm from 300 to 450 MHz
- Current Consumption is Scaled by Output Power Programming
- Fast Crystal Oscillator Start-up Time of Typically 200 μ s
- Low Current Consumption of Typically 7.3 mA at 5.5 dBm
- Just One 13.0000 MHz Crystal for 314.1 to 329.5 MHz and 424.5 to 439.9 MHz Operation
- Single-ended RF Power Amplifier Output
- Output Power from -0.5 to +12.5 dBm
- RF Frequency from 300 to 450 MHz with Different Crystals
- FSK Deviation with 396 Hz Resolution
- Data Rate up to 40 kbit/s (Manchester)
- Supports Multi-channel Operation

2.2 Pin Configurations

Figure 2-1. Pin Out for QFN 32 Package

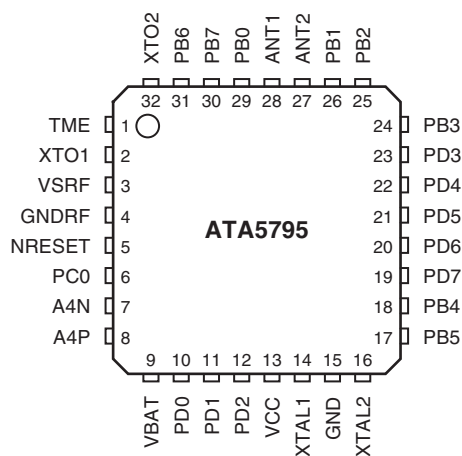


Table 2-1. Pin Description

Pin Number	Pin Name	Alternate Function 1	Alternate Function 2	Function	Comment
1	TME	-	-	Test mode enable	
2	XTO1	-	-	Connection for RF crystal	RF - pin
3	VSRF	-	-	Power supply voltage RF	RF - pin
4	GNDRF	-	-	Power supply ground RF	RF - pin
5	NRESET	dW	-	Reset input / debugWire interface	
6	PC0	-	-	I/O port	Port C0
7	A4N	-	-	Input pin for transponder AFE	
8	A4P	-	-	Input pin for transponder AFE	
9	VBAT	-	-	Power supply voltage for battery	
10	PD0	INT0	PCINT8	I/O port / external interrupt input 0	Port D0
11	PD1	T3ICP	PCINT9	I/O port / timer 3 external capture input	Port D1
12	PD2	TEI	PCINT10	I/O port / external timer input clock	Port D2
13	VCC	-	-	Power supply voltage for the microcontroller. A capacitor with capacitance C_{BUF} must be connected at this pin to buffer the voltage during field supply and block the microcontroller VCC.	
14	XTAL1	-	-	32 kHz crystal oscillator input pin	
15	GND	-	-	Power supply ground	
16	XTAL2	-	-	32 kHz crystal oscillator output pin	
17	PB5	TM5	PCINT5	I/O port / timer modulator pin 5	Port B5
18	PB4	TM4	PCINT4	I/O port / timer modulator pin 4	Port B4
19	PD7	TM3	PCINT15	I/O port / timer modulator pin 3	Port D7
20	PD6	TM2	PCINT14	I/O port / timer modulator pin 2	Port D6
21	PD5	TM1	PCINT13	I/O port / timer modulator pin 1	Port D5
22	PD4	ECIN0	PCINT12	I/O port / external clock input 0	Port D4
23	PD3	-	PCINT11	I/O port	Port D3
24	PB3	MISO	PCINT3	I/O port / SPI	Port B3
25	PB2	MOSI	PCINT2	I/O port / SPI	Port B2
26	PB1	SCK	PCINT1	I/O port / SPI	Port B1
27	ANT2	-	-	RF antenna 2	RF - pin
28	ANT1	-	-	RF antenna 1	RF - pin
29	PB0	NSS	PCINT0	I/O port / SPI	Port B0
30	PB7	-	PCINT7	I/O port	Port B7
31	PB6	-	PCINT6	I/O port	Port B6
32	XTO2	-	-	Connection for RF crystal	RF - pin

3. Ordering Information

Extended Type Number	Package	Remarks
ATA5795-PNQW	QFN32 - 5x5	Pb-free

4. Package Information

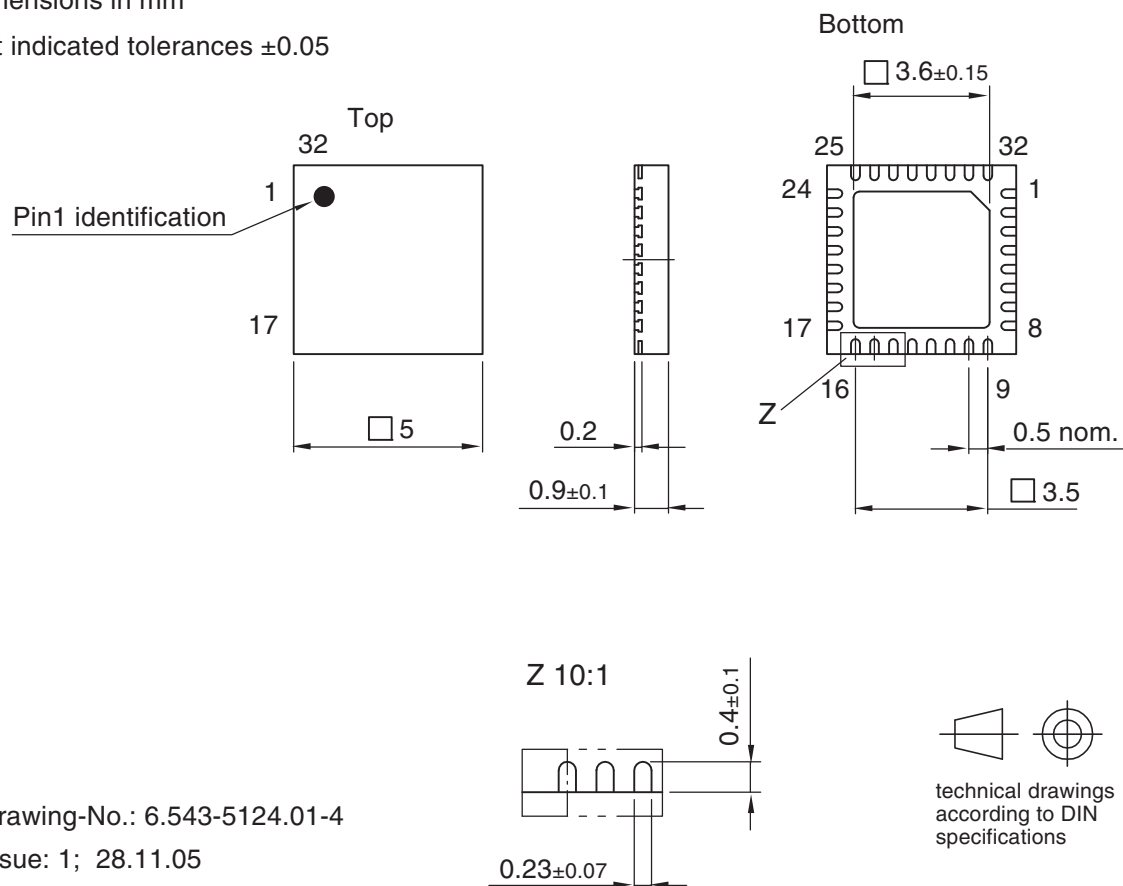
Figure 4-1. QFN 32 - 5x5 Package

Package: QFN_ 5 x 5_32L

Exposed pad 3.6 x 3.6

Dimensions in mm

Not indicated tolerances ± 0.05



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