



SIC614E

LF HDX immobilizer tag with 40-bit encryption
REV 1.0

Features Summary

Highlight Features

- Single-chip security transponder ideal for access control applications
- Low-frequency HDX technology at 134.2 kHz field frequency
- Best-in-class read and write sensitivity
- Encrypted security with built-in 40-bit classical encryption
- Fast authentication

Supported Protocol

- ASK downlink data transmission
- FSK uplink at 134kHz/123kHz with RF/16 data rate
- Fully compatible with D40 command sets and protocol
- ID4E transponder family replacement

Memory

- 8-bit manufacture code
- 24-bit unique device identification
- 40-bit secret key for authentication
- 8-bit user memory
- 88-bit total eeprom memory
- Memory erase/write cycle up to 100,000 cycles
- Memory retention up to 20 years

Package

- Wedge

Revision History

Revision	Date	Description	Change/Update Comment
1.0	13 Feb 2026	Release	1st Initial product datasheet

Ordering information

Part No.	Description	Package	Mark
PA3AW303EP0SU4D64C3	SIC614D-64, Immobilizer LF HDX with 40bit encryption Wedge 134.2kHz, Canister, RFID TAG	Wedge	-

The information herein is for product information purpose. While the contents in this publication have been carefully checked; no responsibility, however, is assumed for inaccuracies. Silicon Craft Technology PLC. reserves the right to make changes to the products contained in this publication in order to improve design, performance or reliability.

Contents

0. Notation	7
0.1 Styles and Fonts for key words	7
0.2 Abbreviation.....	8
1. Functional Overview.....	9
1.1 Block Diagram.....	9
1.1.1 Analog Front End (AFE)	9
1.1.2 Digital Controller	10
2. Specification	11
2.1 Absolute Maximum Rating	11
2.2 Environment and Data Reliability	11
2.3 Environment and Data Reliability	11
2.4 Timing Characteristic	12
3. Memory organization	13
3.1 EEPROM Organization.....	13
4. Packaging Information	14
5. Packing Specification.....	15

List of Figures

Figure 1-1: SIC614E block diagram	9
Figure 3-1: Memory organization	13
Figure 4-1: Wedge Transponder Drawing	14
Figure 5-1: Product packing	15
Figure 5-2: Inner box dimension	15
Figure 5-3: Outer box dimension	15

List of Tables

Table 0-1: Style and Fonts key word	7
Table 0-2: Abbreviation	8
Table 2-1: Absolute Maximum Rating	11
Table 2-2: Environment and Data Reliability	11
Table 2-3: Electrical Characteristic	11
Table 2-4: Timing Characteristic	12
Table 4-1: Physical Characteristic	14
Table 5-1: Canister information	15
Table 5-2: Inner box information	15
Table 5-3: Outer box standard packing information	15

0. Notation

0.1 Styles and Fonts for key words

This part defines styles and fonts used for the key words throughout this document. The key words are names of signal, register, pin, state of operation and command. The styles, fonts, and their indications are shown in Table 0-1.

Table 0-1: Style and Fonts key word

Symbol	Indication
<i>Signal</i>	Signal name
Register	Register name or Bit name
pin RX	Pin name
<i>"State of Operation"</i>	State of operation
Command	Command name for RF interface
"Flag"	Flag name in response state

- To refer to a register address and a value in a register, a hexadecimal number proceeding with letter "0x" is used, for example 0x0A.
- To refer to a bit located in a register address, a symbol "." following by a number reflecting the bit location starting from 0 to 7 is used. For example, 0x0A.0 refers to bit 0, least significant bit, in the register 0x0A.
- To refer to a set of consecutive bits located in a register address, a format "[msb:lsb]" is used after a register value. For example, a value of 0x0A.[3:0] refers to bit 3, 2, 1, and 0 in the register 0x0A.
- To refer to a binary value in some registers, the letter "b" is placed at the end of the binary number, for example "1010b".
- To refer to logic level, the number in single quote '1' and '0' are used to refer to binary logic level.

0.2 Abbreviation

Table 0-2: Abbreviation

Abbreviation	Term
AFE	Analog-Front-End
CRC	Cyclic redundancy check
EEPROM	Electrically Erasable Programmable Read-Only Memory
EOB	End of burst
fc	Carrier frequency
FSK	Frequency Shift Keying
HDX	Half duplex
HV	High-voltage supply
LF	Low frequency
OTP	One-time program
POR	Power-on-reset
PWD	Pre-defined password
RFID	Radio frequency identification
SIC	Silicon Craft Technology

1. Functional Overview

SIC614E is a low-frequency half-duplex RFID tag with a built-in encryption module, which enables the tag to process authentication operations required for automotive immobilizer applications. It can be configured to work with either a 40-bit key. The tag operation is compatible with 40-bit classic immobilizer tags on the market.

1.1 Block Diagram

Figure 1-1 depicts a conceptual block diagram of SIC614E, which mainly consists of two parts as listed below:

- RF Analog Front End (RF-AFE)
- Digital Controller and Memory

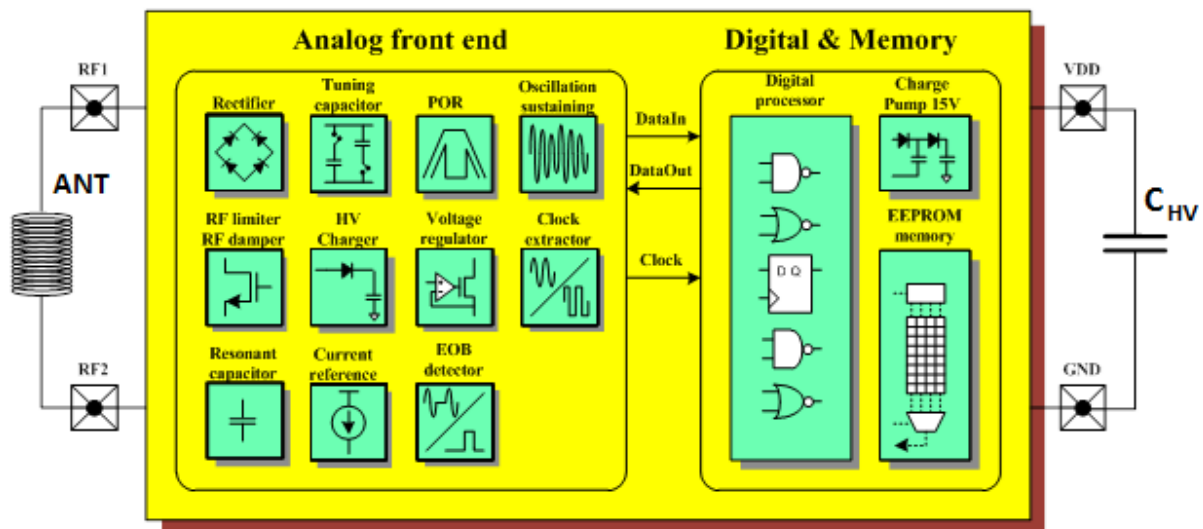


Figure 1-1: SIC614E block diagram

1.1.1 Analog Front End (AFE)

The RF Analog-Front-End (AFE) has RF1 and RF2 terminals for connecting to an external antenna, VDD and GND terminals for connecting to the external storage capacitor (CHV). It harvests energy from the induced RF signal in the antenna and stores the energy in the CHV to supply the internal circuit. The AFE also provides facilities for RF communication, such as a modulator for uplink data communication, a demodulator for downlink data communication, a power-on-reset module, and a clock extractor for data synchronization.

1.1.2 Digital Controller

The digital controller controls data transactions between the AFE and the EEPROM. The digital controller handles the following operations:

- Decoding incoming RF downlink commands and encoding RF uplink data/response
- Reading and programming data from/to the EEPROM
- Process authentication using an encryption module

2. Specification

2.1 Absolute Maximum Rating

Conditions above the listed maximum ratings may cause permanent damage to the device. Exposure to the absolute maximum rating conditions for an extended period may affect the device's reliability. Only one absolute maximum rating can be applied at a time.

Table 2-1: Absolute Maximum Rating

Parameter	Symbol	Min	Typ	Max	Unit
Operating temperature	T_A	-40		+85	°C
Storage temperature	T_S	-40		+100	°C

2.2 Environment and Data Reliability

Table 2-2: Environment and Data Reliability

Parameter	Description	Min	Typ	Max	Unit
Programming cycle	@25°C	100k			Cycles
Data retention time	@50°C storage temp.	20			Years
ESD immunity	IEC 801-2	2			kV
Vibration	IEC 68-2-6 Test 10g, 10-2000Hz, 2axis	2.5			Hr
Drop	Test 1.8m free fall	100			Time
Shock	IEC 68-2-29 Test 40g, 18ms	2000			Time

2.3 Environment and Data Reliability

Table 2-3: Electrical Characteristic

Parameter	Symbol	Min	Typ	Max	Unit
Operating resonant frequency	f_{RES}		134.2		kHz
Low bit response frequency	f_L	131.2	134.2	137.2	kHz
High bit response frequency	f_H	120.7	123.2	126.2	kHz
Operating RF level	$V_{H,Cmd}$	4			V
Operating RF level for memory programming	$V_{H,Prog}$	5			V

2.4 Timing Characteristic

Timing parameters listed in the table specify RF protocol pattern in Table 2-4.

Table 2-4: Timing Characteristic

Parameter	Symbol	Min	Typ	Max	Unit
Charge Time (Charge)	t_{Chg}	15	50		ms
Pulse-off for low bit	t_{OffL}	8	24	36	clk
Pulse-on for low bit	t_{OnL}	2	24	220	clk
Pulse-off for high bit	t_{OffH}	48	64	220	clk
Pulse-on for high bit	t_{OnH}	8	64	220	clk
Execution (t_{EXE})					
Authentication time	t_{AUTH}		512		clk
Programming Time		15			ms

Note:

* This timing is measured at 134.2 kHz. The value may be changed from various factors such as detuning and coupling factor with reader antenna.

** 1 clk = 1 period of RF cycle

3. Memory organization

3.1 EEPROM Organization

SIC614E contains 88 bits of non-volatile EEPROM memory, which is shown in the figure below, starting with the MSbit first.

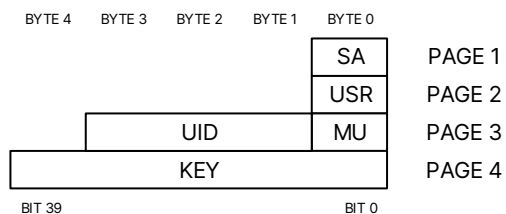


Figure 3-1: Memory organization

This SIC614E Memory contains all mandatory information of the tag, such as serial number, manufacturing code, selective address, function bytes, and encryption key. This memory section can be accessed using classic commands such as **READ**, **AUTHEN**, **PROGRAM**, **LOCK**, etc.

4. Packaging Information

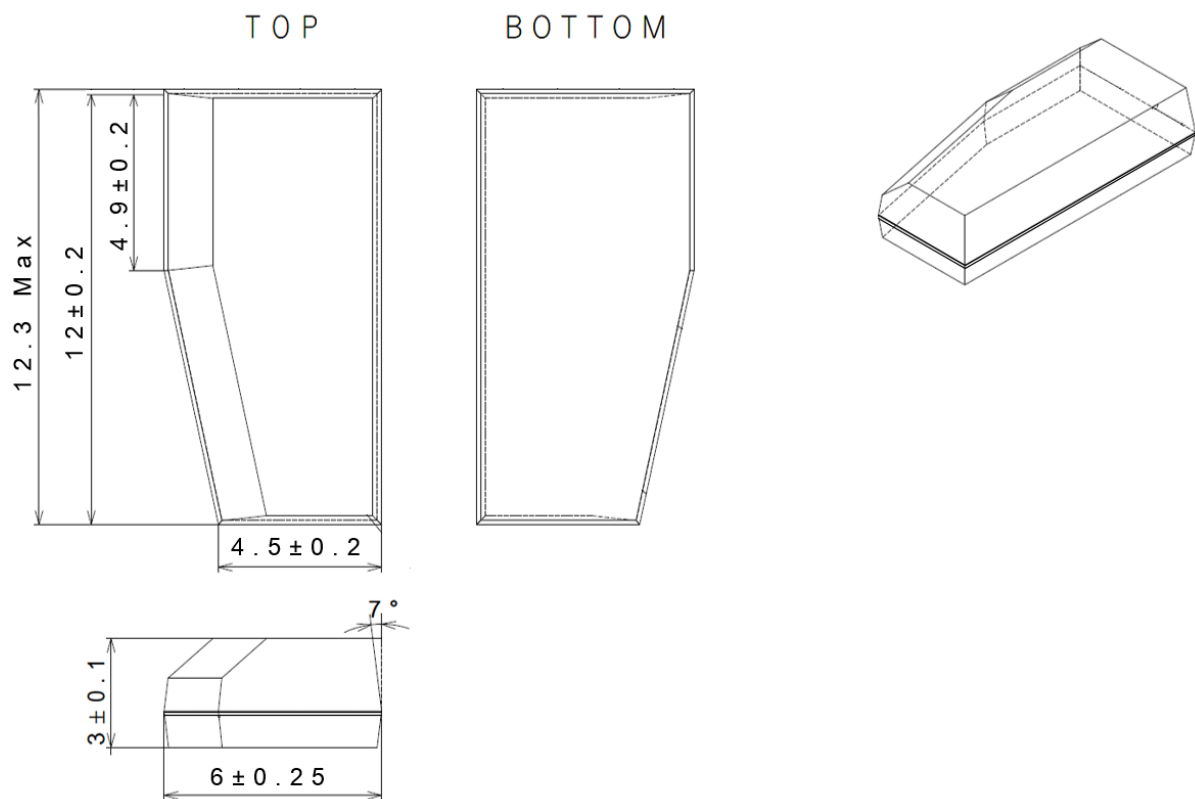


Figure 4-1: Wedge Transponder Drawing

Table 4-1: Physical Characteristic

Parameter	Symbol	Min	Typ	Max	Unit
Width	W	5.75	6	6.25	mm
Length	L	11.9	12	12.3	mm
Height	H	2.9	3	3.1	mm

5. Packing Specification



Figure 5-1: Product packing

Table 5-1: Canister information

Packing information	Value	Unit
Canister PVC dimension	ø116 x 128.5	mm
Product quantity per canister	2,000	ea.
Canister weight (Included product)	0.93	kg



Figure 5-2: Inner box dimension

Table 5-2: Inner box information

Packing information	Value	Unit
Inner box dimension (l x w x h)	255 x 255 x 180	mm
Canister quantity per inner box	4	ea.
Inner box weight (Included product)	3.96	kg



Figure 5-3: Outer box dimension

Table 5-3: Outer box standard packing information

Outer box standard	Outer box dimensions l x w x h (mm)	Total maximum weight (kg)	Inner box quantity
1	330 x 240 x 310	4.46	1
2	390 x 380 x 390	8.92	2
3	620 x 390 x 390	17.14	4

The outer box has three standard box sizes depending on the order.