SILICON CRAFT TECHNOLOGY PLC

Leading RFID ICs & NFC Solutions with Customized ASIC Design Expert

SHAPE THE WORLD OF SECURED AND CONNECTED DEVICES WITH

INNOVATION & INTELLIGENCE

Silicon Craft, Thailand's first and only privately held semiconductor design company, is renowned for its expertise in designing and delivering linear and mixed-signal integrated circuits.

With extensive experience and partnerships with top-tier foundries and semiconductor manufacturers, we are a prominent global provider of RFID chips.

Established in 2002, we offer innovative, custom, and standard-designed microchips for RFID applications, delivering products with high value-added features and superior overall system performance.

- Leading company in NFC anti-counterfeiting application
- Forefront in NFC-sensor interfaces for smart healthcare and environmental chemical sensing
- Expert in low-power, mixed-signal ASICs design
- Proven expertise in cryptographic RF communication technology

PRODUCTS & SERVICES

RFID/NFC Integrated Circuit for :

- Advanced NFC
- Industrial IoT
- Immobilizer
- Animal ID

ASICs

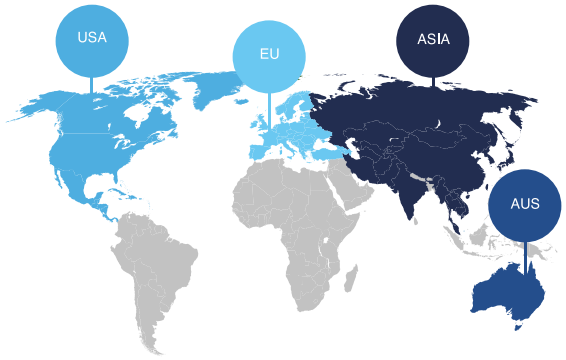
Custom Design to Target a Wide Range of Applications and Use Cases

APPLICATIONS

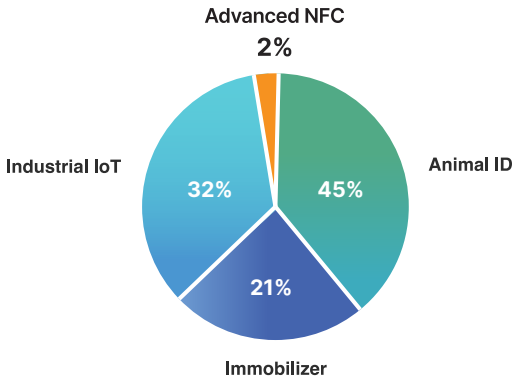
- Anti-Counterfeiting & Brand Protection
- Smart Home & Building
- Medical Devices & Healthcares
- Toy & Game
- Automotive
- Livestock

Market Coverage

Our target strategic growth countries:
EU, USA, Japan, Korea, Australia, China, India



Revenue Contribution



RFID PRODUCT LINE

Advanced NFC

NFC Tag IC for Connectivity with UART Interface
SIC4310/SIC4311
- NFC tag IC with dynamic NDEF for web-based authentication

NFC Tag IC for Authentication with On-Chip Encryption Engine
SIC43NT/SIC43S1
- NFC tag IC with dynamic NDEF for web-based authentication

NFC Tag IC for Sensor Interface with On-Chip Sensor Biasing and 12-bit ADC
SIC4340/SIC4341/SIC4343
- Single chip with NFC to sensor connection which can be used in battery-less application

Industrial IoT

ISO14443A HF Reader IC
RA10
- Support transmitter supply up to 7V

Multi-Protocol HF Reader IC
RE31
- Support ISO 14443 A/B and ISO 5693
- Support transmitter supply up to 7V

Multi-Protocol HF Reader IC with JIS-X-6319-4
RE41
- Additional support JIS-X-6319-4
- Support transmitter supply up to 7V

Multi-Protocol HF Reader IC with Low Power Card Detection Mode
RA12
- Support ISO 14443 A/B and ISO 15693
- Consumes only 4.7 µA in card detection mode

Multipage HDX Transponder for Industrial Application
SIC73F1
- LF HDX transponder with EEPROM 1,360 bits in 17 pages read/write memory

LF HDX Transponder for Industrial Application
SIC73WR
- LF HDX transponder with 80-bit programmable code

ISO/IEC 15693 Tag IC for Industrial Application
SIC56NL
- Industrial tag IC compatible with NFC type 5, featuring a reprogrammable digital signature

Immobilizer

LF Automotive Transponder
SIC61 Family
- Automotive transponder with form, function, and performance compatible with the majority of motor vehicles sold worldwide

N-Family Immobilizer Transponder
SIC6146/SIC6146B/SIC6146E/ SIC6147/SIC6149/SIC614A
- 48-bits, 96-bits, and 128-bits encryption with HT algorithm
- LF FDX technology

T-Family Immobilizer Transponder
SIC614C/SIC614D/SIC614E/SIC618A
- 40-bits, 80-bits, and 128-bits encryption with D algorithm
- LF HDX technology

S-Family Immobilizer Transponder
SIC6148/SIC6188/SIC61T5
- 96-bits and 128-bits encryption with M algorithm
- LF HDX technology

A-Family Immobilizer Transponder
SIC618C
- 128-bits encryption with T algorithm
- LF HDX technology

Animal ID

LF FDX-B Transponder IC
SIC7150
- Superior read range performance
- Support mainstream FDX command

LF FDX-A/FDX-B Transponder IC
SIC278
- Outstanding read range performance with tunable capacitor

LF HDX R/O Transponder IC
SIC279
- Best-in-class reading performance HDX tag IC in the market with tunable capacitor

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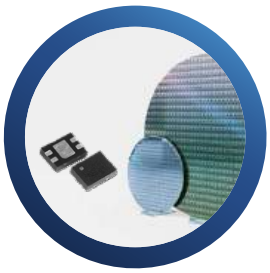
SCAN ME

ADVANCED NFC

SIC43NT
SIC43S1



NFC FORUM TYPE 2 TAG ICs
FOR ITEM-LEVEL AUTHENTICATION

SIC43NT and SIC43S1 are passive NFC Forum Type 2 tag ICs, fully compliant with ISO14443A standard. The user memory of both chips supports NDEF updating with a unique value for each tap, enabling app-less NFC authentication.

For enhanced security, the SIC43S1 contains an AES-128 encryption engine designed for use with mutual authentication and encrypted communication schemes.

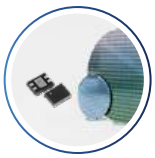
HIGHLIGHT FEATURES

- NFC Forum Type 2 Tag
- Dynamic NDEF Message Containing UID and a Secured Authentication Code (SAC) or Rolling Code for Authentication
- ISO14443A, 106kbps
- 50pF Input Capacitance
- Secured Tamper Detection and Verification via SAC or Rolling Code
- Pin Configuration for RF Field Detection or Tamper Detection (SIC43NT)
- Operating Temperature: -40°C to 85°C

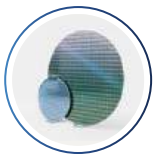
APPLICATIONS

- Item-Level NFC Label or Sticker with Authentication Function
- Smart Packaging
- Vouchers and Coupons
- Access Control Card with Authentication Function

NFC TAG ICs
FOR ITEM-LEVEL AUTHENTICATION



SIC43NT
NFC Forum T2T with Secured Rolling-Code



SIC43S1
NFC Forum T2T with AES-128 Encryption

COMPARISON TABLE

SPECIFICATION	SIC43NT	SIC43S1
Standard	NFC Type 2 Tag	
Memory		
User Memory Size [bytes]	816	144
Retention	10 years	
Write Cycle [times]	100k	100k
Memory Protection	32-bit Password Protection	AES-128 Mutual Authentication
Dynamic NDEF		
UID	14 bytes (ASCII)	
Tamper Status	2 bytes (ASCII)	-
Timestamp	8 bytes (ASCII)	
RLC/SAC	8 bytes (ASCII)	32 bytes (ASCII)
Security		
Mutual Authentication	No	Yes, AES-128
Encrypted Communication	No	Yes, AES-128
I/O Function		
RF Detection	Yes	No
Tampering Detection	Yes	No
Others		
On-Chip Capacitor	50 pF	
Packages	Sawn Wafer with Bump, DFN	Sawn Wafer with Bump

DEVELOPMENT KITS
SUPPORT MATERIALS

- Demo Android APP and Source Code
- Reference PCB Design and Schematic Diagram
- Reference Antenna and Antenna Design Tool

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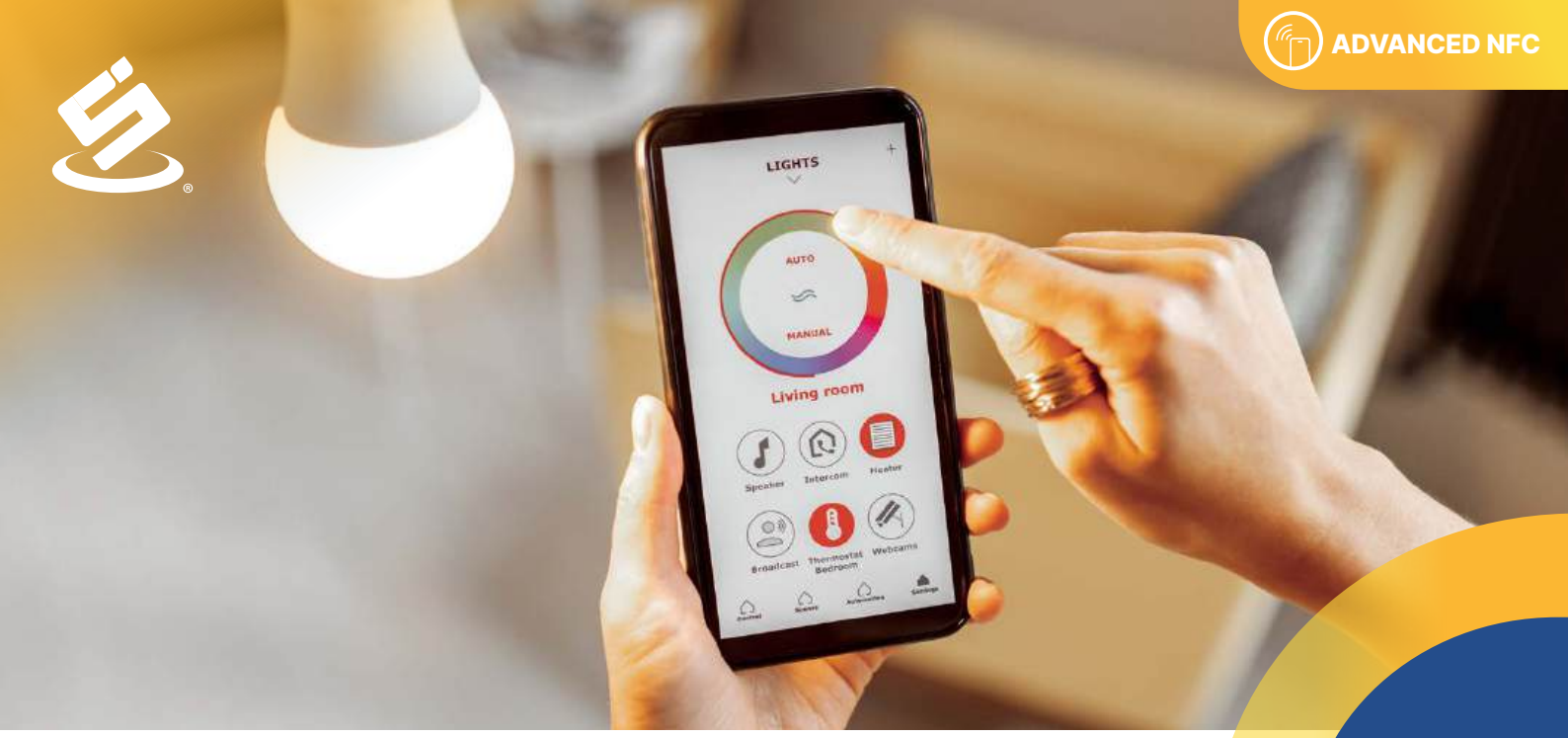
ADVANCED NFC



NFC TYPE 2 TAG ICs

WITH UART INTERFACE AND ENERGY HARVESTING FUNCTION

SIC4310
SIC4311

SIC4310 and SIC4311 are NFC type 2 tag ICs with UART interface that bridge data transfer between NFC devices and UART-connected devices such as MCUs.

In addition, SIC4310 and SIC4311 can harvest energy for peripheral circuit up to 10mA from desktop RFID readers or up to 7mA from typical NFC phones. This energy harvesting capability enables 'batteryless' applications that instantly operate when an NFC device is tapped, even without a battery inside.

Energy Harvesting

UART & GPIO Interface

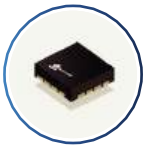
HIGHLIGHT FEATURES

- NFC Forum Type 2 Tag With Additional Commands
- Direct Data Transfer Between NFC and UART, or Vice Versa
- Utilizes NFC Energy Harvesting for Self-Operation or External Power Sourcing
- 3.3V On-Chip Regulator for Energy-Harvesting Output
- NFC Energy Harvesting: Up to 10mA Capability to Power External Circuits (Depending on the NFC Device's Output Power)
- 196 Bytes of User Memory

APPLICATIONS

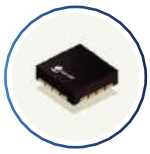
- Shared facility (e.g. washing machine, coffee maker, or printer) personalization and controlling via NFC
- NFC energy harvesting module
- Zero-energy emergency data transfer channel for electricity, water or gas metering
- NFC bridge for medical devices
- Interactive packaging

CONNECTIVITY AND ENERGY-HARVESTING NFC TAG IC



SIC4310

NFC Forum T2T with UART Interface and 8 GPIOs



SIC4311

NFC Forum T2T with UART Interface, 7 GPIOs, and VBAT3V3 Pin

COMPARISON TABLE

SPECIFICATION	SIC4310	SIC4311
Communication		
Standard	ISO14443A, NFC T2T	ISO14443A, NFC T2T
Data Rate [kbps]	106	106
Interface	UART	UART
Buffer Size [byte]	64	64
Memory		
Memory Size [byte]	196	196
Data Retention [year]	10	10
Write Cycle [times]	100,000	100,000
Operating Condition		
Operating Temperature	-40 to 85°C	-40 to 85°C
Maximum Standby Current	80µA (use XVDD pin)	0.1µA (use VBAT3V3 pin)
External Input Supply Voltage	2.7V to 3.6V (use XVDD pin)	3.0V to 10.0V (use VBAT3V3 pin)
Maximum Harvesting Current		
Harvest from Mobile Phone	7.82mA @3V	7.82mA @3V
Harvest from Desktop Reader	10.2 mA @2.87V	10.2 mA @2.87V
Pinouts and Peripherals		
GPIO pins	8	7
On-chip Capacitor [pF]	30.3	30.3
Packages	QFN3×3 -16 pins	QFN3×3 -16 pins

DEVELOPMENT KIT

- SIC4310-HV Development Kit : P10CK081PB0S110D0CBA

- SIC4310-FU Development Kit : P10CSECR000SN10D1CB

DEVELOPMENT KIT SUPPORT MATERIAL

- Firmware Source Code (SIC4310-FU)
- Demo Android/iOS App and Source Code
- Reference PCB Design and Schematic Diagram
- Reference Antenna and Antenna Design Tool

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ADVANCED NFC

SENSOR INTERFACE PRODUCTS

SIC4340
SIC4341
SIC824B
SIC4343

GALVANOSTAT SENSOR SIC4340

PRINCIPLE Chip bias current and measure voltage in response to changes in resistance or capacitance across sensor

APPLICATION Resistance, Capacitance, Temperature, Water TDS, etc.

POTENTIOSTAT SENSOR SIC4341

PRINCIPLE Chip bias voltage to WE-RE and measure current across electrochemical sensor

APPLICATION Heavy Metal, Glucose, Ketone, Uric acid, Cortisol, Hepatitis B Virus, Chemical Substances, Biomarkers, etc.

VOLTAGE SENSOR SIC4343

PRINCIPLE Chip bias voltage and measure voltage in response to changes in resistance across sensor (open circuit potential)

APPLICATION pH, Force, Strain, Ion Elements such as Na^{+}, K^{+},Ca^{2+},Mg^{2+}, Biomarkers, etc.

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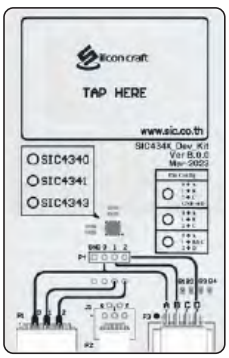
SIC4340 GALVANOSTAT SENSOR

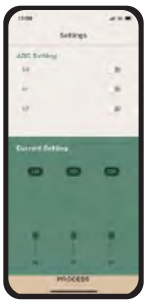
SIC4340

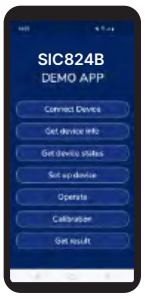
NFC type 2 tag IC with built-in current source and ADC for galvanostat measurement.

SPECIFICATIONS	SIC4340
Communication Interface	NFC Type 2 Tag
Product Form Factor	QFN, Sawn Wafer with Bump
Biasing Current Range	1 - 63 µA with 1 µA / Step 8 - 504 µA with 8 µA / Step
Bias Wave Form	• DC • Square Wave with Selectable Frequency 300 Hz - 50 kHz
Voltage Measurement Range	0.2 to 1.2 V
Measurement Accuracy	± 1.2 mV
Voltage Limiter	1.28 V
Multiplexing	3 Channels
Application Example	Resistive Sensor Capacitive Sensor Temperature Sensor Water TDS (Total Dissolved Solid)

DEVELOPMENT KIT




SIC4340



SIC824B


SIC4341


SIC4343

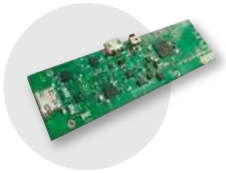
SUPPORT MATERIAL

- Demo iOS/android application
- Reference PCB design and schematic diagram
- Reference antenna and antenna design tool

SIC4341 POTENTIOSTAT SENSOR

SIC4341

NFC Type 2 tag IC with built-in ADC and potentiostat sensor interface for electrochemical measurement



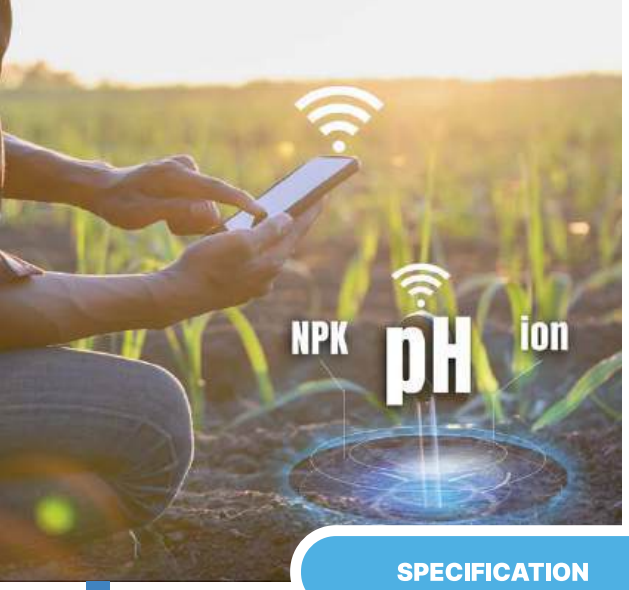
SIC824B

Potentiostat sensor module with bluetooth® 5.2 for electrochemical measurement

SPECIFICATIONS	SIC4341 Potentiostat Sensor Interface	SIC824B Potentiostat Sensor Module
Communication Interface	NFC Type 2 Tag	Bluetooth® 5.2
Product Form Factor	QFN, Sawn Wafer with Bump	PCB
Bias Voltage Range	-0.8 to +0.8 V	- 1.6V to 1.6V (1.6V Dynamic Range) ● - 1.6 to 0 V ● - 0.8 to + 0.8 V ● 0 to + 1.6 V
Bias Voltage Resolution	5 mV/Step	5 mV/Step
Current Measurement Range	Selectable ± 2.5 µA ± 20 µA	Hardware fix Customizable Maximum ± 500 µA
Pin Configuration	Configurable WE, RE, CE	Fixed Position
Measurement Accuracy	± 5 nA for ± 2.5 µA Range ± 20 nA for ± 20 µA Range	± 0.1% of Current Range
Compatible Analysis Technique	Amperometry Voltammetry	Amperometry Voltammetry Open Circuit Potential (OCP)
Application Example	Chemical Sensor Biochemical Sensor	Chemical Sensor Biochemical Sensor Potentiometric Sensor

Screen-Printed Electrode (SPE) on PET Substrate
3 Electrodes Including;

- Working Electrode: Graphene (Size: Diameter 3 mm)
- Counter Electrode: Graphene
- Reference Electrode: Ag/AgCl



SIC4343 VOLTAGE SENSOR

SIC4343

NFC type 2 tag IC with built-in DACs and ADC for voltage measurement which can be configured to single-ended or differential-ended mode.

SPECIFICATION

	Single Ended Voltage Sensor Interface Chip	Differential Ended Voltage Sensor Interface Chip
Communication Interface	NFC Type 2 Tag	
Product Form Factor	QFN, Sawn wafer with bump	
DAC Resolution	8-bit	
Bias Voltage	0.2 to 1.2 V	
Measurement Method	Measure voltage with respect to GND	Measure voltage between 2 pins
Voltage Measurement Range		
Input Buffer in Enable	0.2 to 1.2 V	-1 to +1 V
Input Buffer in Disable	0 to 1.2 V	-1.2 to +1.2 V
Measurement Accuracy	± 1.2 mV	
Sampling Rate	10 sps	
Application Example	Industrial Sensor Chemical Sensor Biochemical Sensor	

REFERENCE CASES

Year	Application	Author	Affiliation	Journal	Reference
2023	Hydroquinone	Charles S. Henry	Colorado State University, US	Electroanalysis	Electroanalysis.2023;35:e202200552
2023	Cortisol	Fabiana Arduini	University of Rome Tor Vergata, Italy	Sensors and Actuators B: Chemical	Sensors & Actuators: B. Chemical 379 (2023) 133258
2023	Breast cancer sensor	Warakorn Limbut	Prince Songkla University, Thailand	Microchimica Acta	Microchimica Acta (2023) 190:232
2022	Formaldehyde sensor	Warakorn Limbut	Prince Songkla University, Thailand	Talanta	Talanta 254 (2023) 124169
2022	Multi-detection, COVID & antibiotic drug	Can Dincer	University of Freiburg, Germany	Materialstoday	Materials Today (2022) 61:129-138
2022	Leptospirosis	Sudkate Chaiyo	Chulalongkorn University, Thailand	Analytical Chemistry	Anal.Chem.(2022) 94: 14583−14592
2022	Heavy metals (As(III), Cr(VI), Hg(II), Pb (II), Cd (II))	Orawon Chailapakul	Chulalongkorn University, Thailand	Microchimica Acta	Microchimica Acta (2022) 189: 191
2022	Pesticides	Chanchana Thanachayanont	National Metal & Materials Technology Center (MTEC), Thailand	IEEE	19th International Conference on Electrical Engineering/Electronics, Computer, Telecommunications and Information Technology (ECTI-CON) (2022)
2021	Hepatitis-B	Orawon Chailapakul	Chulalongkorn University, Thailand	Sensors and Actuators B: Chemical	Sensors & Actuators: B. Chemical 326 (2021) 128825
2021	NFC-based sensing technologies article	Firat Güder	Imperial College London, UK	Nature Reviews Materials	Nature Reviews Materials volume 6, pages (2021) 286–288

ENHANCING LEARNING THROUGH HANDS-ON EXPERIENCE

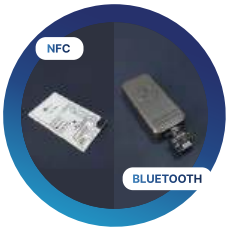
ELECTROCHEMISTRY EDUCATIONAL KITS

ELECTROCHEMISTRY EDUCATIONAL KITS

Electrochemistry educational kits are alternatives to the insufficient of electrochemical analysis equipment in schools and universities.

With over two decades experiences in wireless communication, we successfully developed NFC with sensor interface chip enabling low-cost and portable electrochemical analysis device for individual learning experience anytime anywhere.

THE KITS CONSIST OF



1 WIRELESS POTENTIOSTAT & GALVANOSTAT KIT

NFC, Bluetooth

2 MOBILE APPLICATION

Android/ iOS

SIC4340 Generic

SIC4343

SIC824B

Chemister

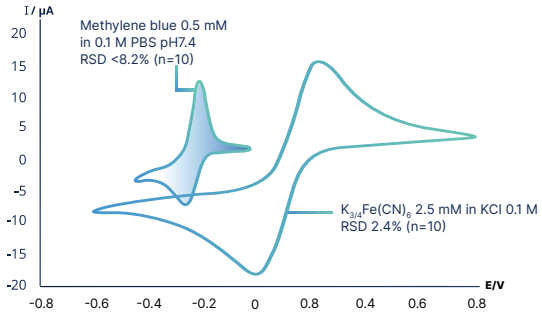
3 SCREEN PRINTED ELECTRODES (SPEs)

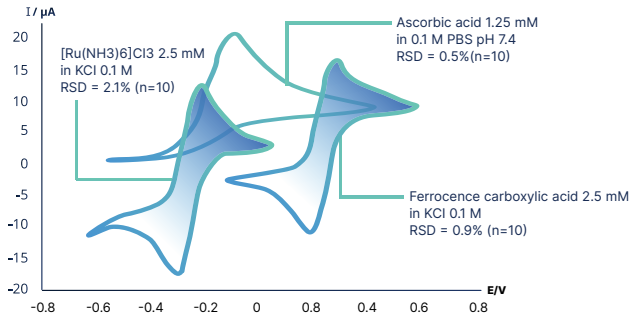
Carbon-Gr

ADVANTAGES

- **Increase accessibility to electrochemistry lab:**
  A budget-friendly portable galvanostat and potentiostat kit provides a hands-on learning experience for all students.
- **Gain more understanding in input-output signal in electrochemical analysis:**
  Students can easily understand the input and output signal of their measurement configuration through real-time graph.
- **Capability to achieve higher technology readiness level:**
  Students can easily understand the input and output signal of their measurement configuration through real-time graph.
- **Improved teaching efficiency:**
  Engage and motivate students by utilizing easy-to-use innovative galvanostat and potentiostat kit.
- **Multidiscipline skills:**
  Students can practice both analytical chemistry and NFC wireless technology using their own smartphones.

Cyclic Voltammograms of Various Electrochemical Substances using Silicon Craft's SPEs





SENSOR PRODUCT SUMMARY





	SIC4340	SIC4341	SIC824B	SIC4343 Single-Ended Mode	SIC4343 Differential Mode
RFID Features					
Working Principle	Chip excites sensor with current, then measures the changes in sensor through voltage	Chip excites sensor with potential and induce electrochemical reaction to occur, then measures the changes in sensor through current	Chip excites sensor with potential and induce electrochemical reaction to occur, then measures the changes in sensor through current	Chip measures voltage with respect to GND	Chip measures voltage between 2 pins
Communication Interface	NFC Type 2 Tag ISO14443A	NFC Type 2 Tag ISO14443A	Bluetooth® 5.2 BLE	NFC Type 2 Tag ISO14443A	NFC Type 2 Tag ISO14443A
Power Management	RF On-chip regulator 1.9 V		Lithium rechargable battery 3.7 V 320 mAh	RF On-chip regulator 1.9 V	
Number of Channels	3 I/O 3 channels - configurable	3 I/O Configurable WE, RE, CE	3 I/O Fixed position WE, RE, CE	3 I/O 2 channels - configurable Voltage source = 2 pins ADC input = 1 pin	3 I/O 1 channel - configurable Voltage source = 1 pin ADC differential input = 2 pins
Voltage Source					
Bias Wave Form	-	DC			
Bias Voltage Range	-	V(WE-RE) -0.8 V to +0.8 V	V(WE-RE) -1.6 V to 0 V -0.8 V to +0.8 V 0 V to +1.6 V	0.2 V to 1.2 V	
Bias Voltage Resolution	-	5 mV			
Bias Voltage Accuracy	-	± 2 mV			
Current Source					
Bias Wave Form	1) DC 2) Square wave at selectable frequency 300Hz – 50kHz	-	-	-	-
Bias Current Range/ Resolution	Range 0: 1 - 63 µA Range 1: 8 - 504 µA	-	-	-	-
Bias Current Resolution	Range 0: 1 µA /Step Range 1: 8 µA /Step	-	-	-	-
Bias Current Accuracy	Range 0: ± 0.5 µA /Step Range 1: ± 4 µA /Step	-	-	-	-
Analog Input					
Input Impedance	Input buffer is enabled: > 10 MΩ Input buffer is disabled: 18 - 42 kΩ	-	-	Input buffer is enabled: > 10 MΩ Input buffer is disabled: 18 - 42 kΩ	Input buffer is enabled: > 10 MΩ Input buffer is disabled: 18 - 42 kΩ
Measured Current Range	-	Selectable ± 2.5 uA ± 20 uA	Maximum ± 500 uA Fixed by hardware Customizable	-	-
Measured Voltage Range	Input buffer is enabled: 0.2 V to +1.2 V Input buffer is disabled: 0 V to +1.2 V	-	-	Input buffer is enabled: 0.2 V to 1.2 V Input buffer is disabled: 0 V to 1.2 V	Input buffer is enabled: -1 V to +1 V Input buffer is disabled: -1.2 V to +1.2 V
Measured Accuracy	± 2.5 mV	± 5 nA for ± 2.5 uA ± 20 nA for ± 20 uA	0.1% of current range	± 2.5 mV	
Data Conversion Rate	10 sps		50 sps	10 sps	
Memory					
User Memory	144 bytes		376 kbytes	144 bytes	
Erase/Write Cycles	100,000		10,000	100,000	
Data Retention	10 years at 70°C		15 years at 85°C	10 years at 70°C	
Compatible Analysis Techniques					
	Electrical condutivity (EC)	Amperometry Voltammetry	Amperometry Voltammetry Open circuit potential (OCP)	Open circuit potential (OCP)	-
Form Factor					
Leadless	QFN16L 3×3		-	QFN16L 3×3	
PCB	Dev kit 85.6 mm x 54.1 mm		with housing 90 mm x 40 mm	Dev kit 85.6 mm x 54.1 mm	

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INDUSTRIAL IoT

SIC56NL

NFC FORUM TYPE 5 TAG IC

WITH ANTI-COLLISION AND REPROGRAMMABLE DIGITAL SIGNATURE

SIC56NL is a vicinity tag IC compatible with ISO/IEC 15693 and NFC forum type 5 tag, with reprogrammable digital signature.

This chip brings an easy-to-discover NFC experience for consumers, and supports multiple tags reading based on anti-collision standard from ISO/IEC 15693 and includes Electronic Article Surveillance (EAS) feature to deter shoplifting.

SIC56NL supports de facto standard for the read signature command, with 32-byte digital signature allowing item-level verification for consumer without internet access.

HIGHLIGHT FEATURES

- NFC forum type 5 tag compatible
- RF interface based on ISO/IEC 15693
- 320 bytes of user memory with 50 years data retention
- Multiple tag reading with fast inventory read
- On-chip capacitance 23.5 pF
- Electronic article surveillance (EAS)
- Reprogrammable 32-byte digital signature

APPLICATIONS

- Asset and document tracking
- Library management
- Laundry tag
- Pharmaceutical supply chain management
- Toys
- Smart packaging
- Product authentication

NFC FORUM TYPE 5 TAG IC
FOR ASSET TRACKING

SPECIFICATION	SIC56NL
Standard	NFC Type 5 Tag ISO/IEC 15693 with AFI and DSFID Support ISO/IEC 18000-3 Mode 1
Memory	
User Memory Size [bytes]	320
Data Retention [years]	50
Write Cycle [times]	100,000
Access Protection	32-bit or 64-bit Password Protection
Security	
Signature	Reprogrammable
Signature Size [bytes]	32
Signature Technology	Elliptic Curve Digital Signature Algorithm (ECDSA)
Others	
On-Chip Capacitor [pF]	23.5
Packages	Sawn Wafer with Bump

DEVELOPMENT KITS
SUPPORT MATERIALS

- Demo iOS, Android and Windows Application
- Reference Antenna Design and Antenna Design Tools

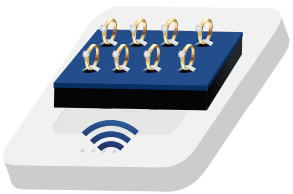
SIC56NL
CONCEPT

Asset & Document Tracking

Long Read Range

Library

Multi-Tag Reading



Fast Anti-Collision

Jewelry Shop

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INDUSTRIAL IoT

SIC279
SIC73WR
SIC73F1

LF HDX RFID TRANSPONDER
FOR INDUSTRIAL APPLICATIONS

SIC279, SIC73WR and SIC73F1 offer a broad range of compatible industrial transponders. These low-frequency (LF) RFID transponders operate at 134.2 kHz, utilizing half-duplex (HDX) technology with 80-bit programmable code, ideal for use with existing HDX RFID infrastructure.

Our LF HDX RFID transponders are highly robust and well-suited for various industrial environments. They provide reliable identification and tracking even in harsh conditions, and are less susceptible to electromagnetic interference or noise (metals, liquids, etc.).

With extended memory, these transponders store and manage large amounts of data across multiple pages, ensuring that information remain accessible and up-to-date even in dynamic environments.

HIGHLIGHT FEATURES

- Compliant with ISO 11784/11785 HDX
- HDX Contactless Read/Write Data Transmission at 134.2 kHz
- Multipage Transponder (MPT)*
- Tunable Resonant Frequency**
- 80-bit Programmable ID Memory
- Best-in-Class Read and Write Sensitivity
- Robust and High-Quality Build

APPLICATIONS

- Industrial Automation
- Access Control
- Asset Management
- Vehicle Identification
- Container Tracking
- Waste Bin Tag (BDE)
- Food Industry
- Cleanroom Manufacturing
- Wafer Carrier Tracking*

(*) SIC73F1 (**) SIC279

LF HDX TRANSPONDER
FOR INDUSTRIAL APPLICATIONS

SIC279
LF HDX RFID transponder
with 192-bit R/W memory

SIC73WR
LF HDX RFID transponder
with 720-bit R/W memory

SIC73F1
LF HDX RFID transponder
with 1,360-bit R/W memory

COMPARISON SPECIFICATION TABLE

SPECIFICATION	SIC279	SIC73WR	SIC73F1
Communication Protocol			
Memory Reading	ISO 11784/11785 HDX	ISO 11784/11785 HDX	ISO 11784/11785 HDX & SEMI-E144-0312
ID Programming	SIC Proprietary	HDX De Facto Standard	HDX De Facto Standard
Read/Write Extended Memory	SIC Proprietary	SIC Proprietary	SEMI-E144-031
Memory			
Programmable ID Memory [bits]	80		
Extended User Memory Size [bits]	192	720	1360 (Multipage - MPT)
Data Retention [bits]	20	20	10
Write Cycles [times]	100k	100k	100k
Security	32-bit Password Authorization	N/A	N/A
Operating Conditions			
Operating Frequency [kHz]	134.2		
Operating Temperature [°C]	–25 to 85	–40 to 85	–25 to 85
Resonant Capacitor			
Integrated Resonant Capacitor [pF]	330	380	N/A
On-Chip Tunable Resonant Capacitor	Yes	N/A	N/A
Tunable Resonant Capacitance Range [%]	±10%	N/A	N/A
Tunable Resonant Capacitance Data [steps]	128	N/A	N/A
Others			
Packages	• Wedge • Glass Tag: 23mm, 32mm • VDFN	• Wedge • Glass Tag: 23mm, 32mm • VDFN	Glass Tag 32 mm (Bio-Glass with Black Epoxy)

SUPPORT MATERIALS

- Silicon Craft Universal LF Reader
- PC Software for Tuning On-Chip Resonant Capacitance

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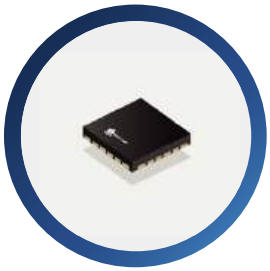
INDUSTRIAL IoT

RA10
RA12
RE31
RE41



HF RFID READER ICs

Silicon Craft's 13.56MHz RFID reader/writer ICs are single-chip ASICs designed. Our products adhere to major global standards, including ISO/IEC 14443A/B, ISO/IEC 15693, and JIS-X-6319-4, ensuring compatibility and reliability across diverse applications.

Harnessing the power of contactless communication through HF RFID technology, our ICs enable wireless identification regardless of external lighting conditions and without the need for line-of-sight. This allows effective detection across various mechanical constraints or vision-blocking obstacles, both indoors and outdoors. This robust technology is ideal for operation in dirty and harsh industrial settings, making it perfect for identifying and monitoring products, carriers, or machine conditions on the production line. It enhances operational efficiency, accuracy, safety, and traceability, while reducing downtime and maintenance costs.

HIGHLIGHT FEATURES

- Support Standard HF RFID Protocols
  - ISO/IEC 14443A
  - ISO/IEC 14443B
  - ISO/IEC 15693
  - JIS-X-6319-4
- SPI Interface
- Power-Down Mode Consumption:
  - 0.6 µA (RA12)
  - 1.0 µA (RA10, RE31, RE41)
- Low-Power Card Detection Mode Consumption:
  - 4.7 µA (RA12)

APPLICATIONS

- Production Line Automation
- Supply Chain Management
- Asset Tracking
- Tool and Equipment Tracking
- Quality Control
- Predictive Maintenance & Monitoring

HF READER ICs FAMILY

RA10
ISO/IEC 14443A

RA12
ISO/IEC 14443A
ISO/IEC 14443B
ISO/IEC 15693
with Low-Power
Card Detection

RE31
ISO/IEC 14443A
ISO/IEC 14443B
ISO/IEC 15693
Support 7V TVDD

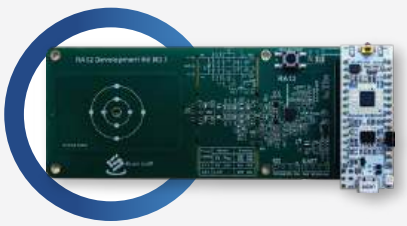
RE41
ISO/IEC 14443A
ISO/IEC 14443B
ISO/IEC 15693
JIS-X-6319-4
Support 7V TVDD

SPECIFICATION TABLE

SPECIFICATION	RA10	RA12	RE31	RE41
Ordering Part Number	PI3AVQO7P60UT1001E1	PI6BVQL5P60UT1201T1	PI5AVQO7P20UT3101E1	PI5AVQO7P20UT3201E1
Protocol				
ISO/IEC 14443A, up to 848 kbps (NFC Type 1,2,4A Tag)	●	●	●	●
ISO/IEC 14443B, up to 848 kbps (NFC Type 4B Tag)	–	●	●	●
ISO/IEC 15693, 1 and 2 Subcarrier (NFC Type 5 Tag)	–	●	●	●
JIS-X-6319-4 (NFC Type 3 Tag)	–	Unsecured Memory Only (Need MCU to Decoder)		Unsecured Memory Only (On-Chip HW Decoder)
Operating Condition				
Receiver Voltage	2.7 – 3.6 V			
Transmitter Voltage	2.7-7.0 V	2.7-5.5 V	2.7-7.0 V	2.7-7.0 V
Operating Temperature	-40 - 85 °C			
Maximum Driving Current	200 mA @ 5 V TVDD 300 mA @ 7 V TVDD	250 mA @ 5 V TVDD	300 mA @ 5 V TVDD 400 mA @ 7 V TVDD	300 mA @ 5 V TVDD 400 mA @ 7 V TVDD
Other Features				
Interface	SPI			
EEPROM	–	–	256 bytes	256 bytes
IRQ Pin	●	●	●	●
Low-Power Card Detection Mode	–	●	–	–
Low-Power Consumption on Power-Down Mode	1 µA	0.6 µA	1 µA	1 µA
Packages	QFN32 (5×5)	QFN24 (4×4)	QFN32 (5×5)	QFN32 (5×5)

DEVELOPMENT KITS

- RA12 Development Kit
- RE31 Development Kit
- RE41 Development Kit



SUPPORT MATERIALS

- Firmware Source Code with Command-Line Instruction via UART
- Demo PC Software (Windows Based)
- Reference PCB Design and Schematic Diagram
- Reference Antenna and Antenna Design Tool

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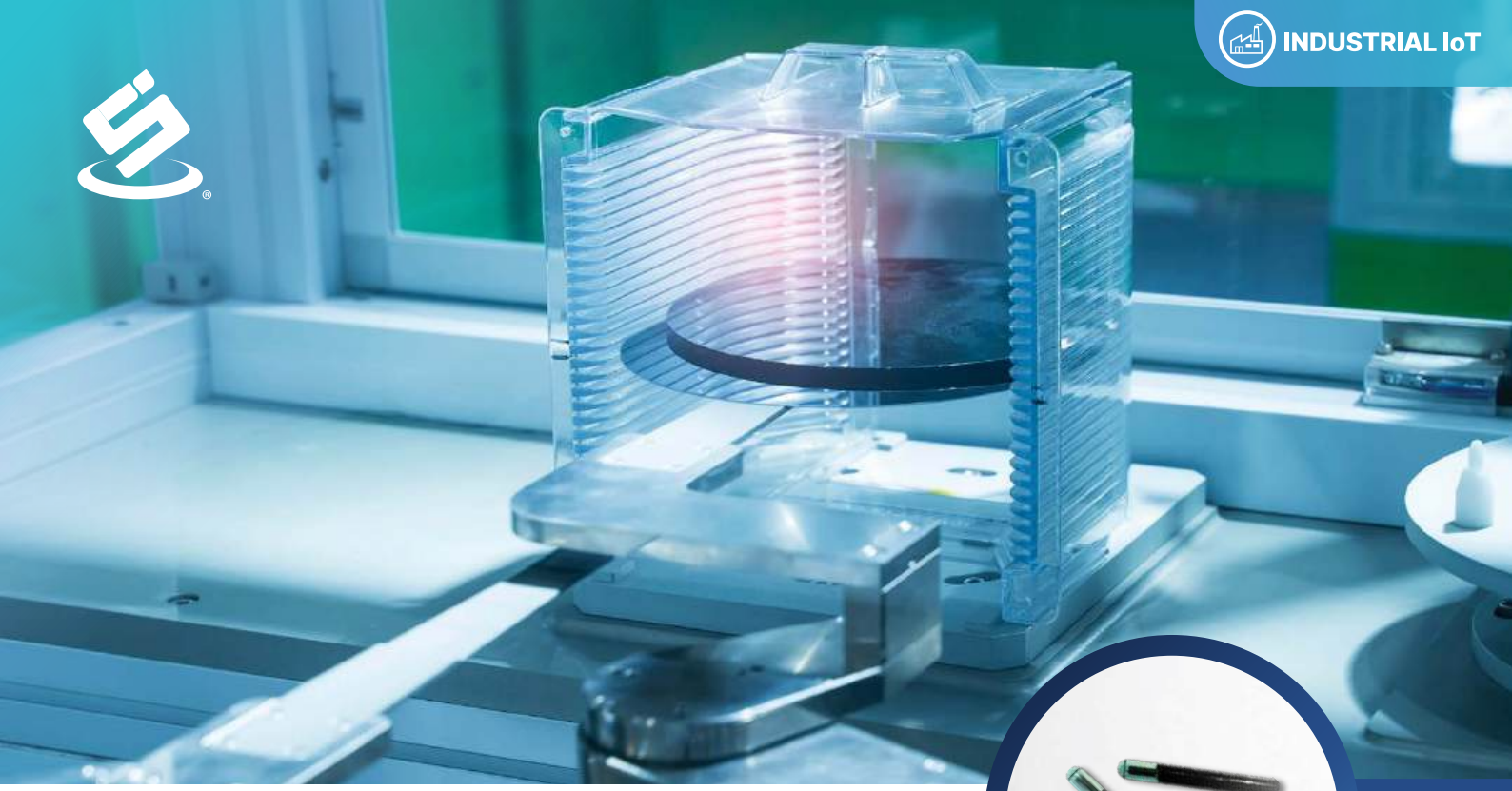

INDUSTRIAL IoT

SIC73F1

LF HDX MULTIPAGE TRANSPONDER

SIC73F1 is a 32mm RFID glass transponder with 1,360-bit multipage read/write memory, operating at 134.2 kHz via a half-duplex protocol. The transponder is robust and well-suited for various industrial tracking applications.

HIGHLIGHT FEATURES

- Half-Duplex Contactless Read/Write Data Transmission
- Multipage Transponder (MPT)
- Drop-in Replacement of RFID Tag for Wafer Carrier
- Robust and High Quality Build

INTERFACE

- Compliant with ISO 11784/11785 HDX Animal Tag ID Data
- Support to SEMI E144-0312
- Uplink Modulation: FSK (Frequency Shift Keying)

MEMORY

- 1,360 bits EEPROM
- 17 Pages Read/Write Memory
- 100,000 Erase/Write Cycles
- 10 Years Non-Volatile Data Retention

APPLICATIONS

- Wafer Carrier Tracking
- Industrial Management
- Access Control System

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AUTOMOTIVE TRANSPONDER

Silicon Craft presents a broad range of compatible automotive transponders with superior performance and reliability, extensively supporting a wide variety of automotive applications. Experience uninterrupted use with our transponders manufactured **AEC-Q100 certified** product line.

Fully Compatible with OEM

Superior Read Range

High-Reliability Circuit and Packaging

AUTOMOTIVE TRANSPONDER PORTFOLIO

SIC6146-6H/BN/EN, SIC6147, SIC614A, SIC6149

SPECIFICATION	SIC6146-6H	SIC6146-BN	SIC6146-EN	SIC6147	SIC614A	SIC6149
Compatibility	ID46	ID46+EE*1	ID46 Ext*1	ID49-1C, ID47	ID4A	ID49*1
Security Algorithm	48-bit / H2 32-bit Password	48-bit / H2		96-bit / H3	128-bit / H-AES	128-bit / H-Pro
Technology	FDX					
Frequency	125 kHz					
Downlink Protocol	ASK					
Uplink Protocol	ASK Manchester and Bi-Phase with RF/32 Data Rate					
EEPROM Memory Size	256-bit	4,096-bit				
Unique ID	32-bit					
User Memory	128-bit	128-bit / Ext. 3,840-bit	128-bit / Ext. 3,584-bit	96-bit / Ext. 3,584-bit	64-bit / Ext. 3,584-bit	
Form Factor	Wedge					
Car Brand *2	Honda, BMW, Nissan, Hyundai , Chevrolet, Kia, Citroen, Peugeot	Honda, BMW, Nissan, Hyundai , Chevrolet, Citroen, Kia, Peugeot	Chevrolet, Opel, GMC	Honda, Hyundai,Fiat, Mitsubishi, Suzuki, Acura, Jeep,Renault	Nissan, Honda, Infiniti, Jeep, Kia, Hyundai	BMW, Chevrolet, Mini Cooper, Ford, Toyota

SIC614C/D/E, SIC618A, SIC61T5, SIC6148, SIC6188, SIC618C

SPECIFICATION	SIC614C	SIC614D	SIC614E	SIC618A	SIC61T5	SIC6148	SIC6188	SIC618C
Compatibility	ID4C*1	ID4D	ID4E, ID64	ID7A, ID8A	T5	ID48	ID88, MQB48*1	ID8C,TEMIC
Security Algorithm	Fixed Code	40-bit / D40 80-bit / D80	40-bit / D40	128-bit / D-AES	Fixed Code	96-bit / M2	128-bit / M-AES 96-bit / M2	128-bit / AUT64
Technology	HDX				FDX			
Frequency	134.2 kHz				125 kHz			
Downlink Protocol	ASK							
Uplink Protocol	FSK Uplink at 134 kHz / 123 kHz with RF/16 Data Rate				ASK Manchester and Bi-Phase with RF/32, RF/40, RF/64 Data Rate	ASK Manchester and Bi-Phase with RF/32 Data Rate		ASK Manchester and Bi-Phase with RF/32, RF/64 Data Rate
EEPROM Memory Size	80-bit	552-bit	88-bit	3,072-bit	160-bit	256-bit	2,048-bit	320-bit
Unique ID	80-bit Programmable ID	24-bit Serial Number 8-bit Manufacturer Code			64-bit/128-bit Programmable ID	32-bit	32-bit Unique ID 1 32-bit Unique ID 2	64-bit/128-bit Programmable ID
User Memory	80-bit	336-bit	8-bit	112-bit / Ext. 1,024-bit	128-bit	94-bit	94-bit / Ext. 1,024-bit	128-bit
Form Factor	Wedge					Glass Tag	Wedge	
Car Brand *2	Ford, Lexus,Mitsubishi, Toyota, Hyundai	Ford, Toyota, Kia Hyundai	Chrysler	Toyota, Subaru, Scion Citroen, Peugeot	Fiat, Audi, Honda	Volkswagen, Audi	Audi, Seat, Skoda, Volkswagen	Mazda, Proton

INFORMATION

*1 Please contact our support team for further product information.
*2 Silicon Craft Technology PLC does not hold intellectual property rights or licenses for the vehicle brands, transponders, or commercial names mentioned in this document. These brands and names are used solely for product communication purposes.

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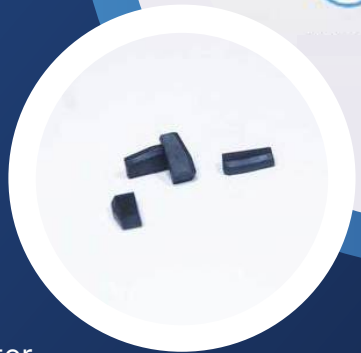
IMMOBILIZER

SIC61AU

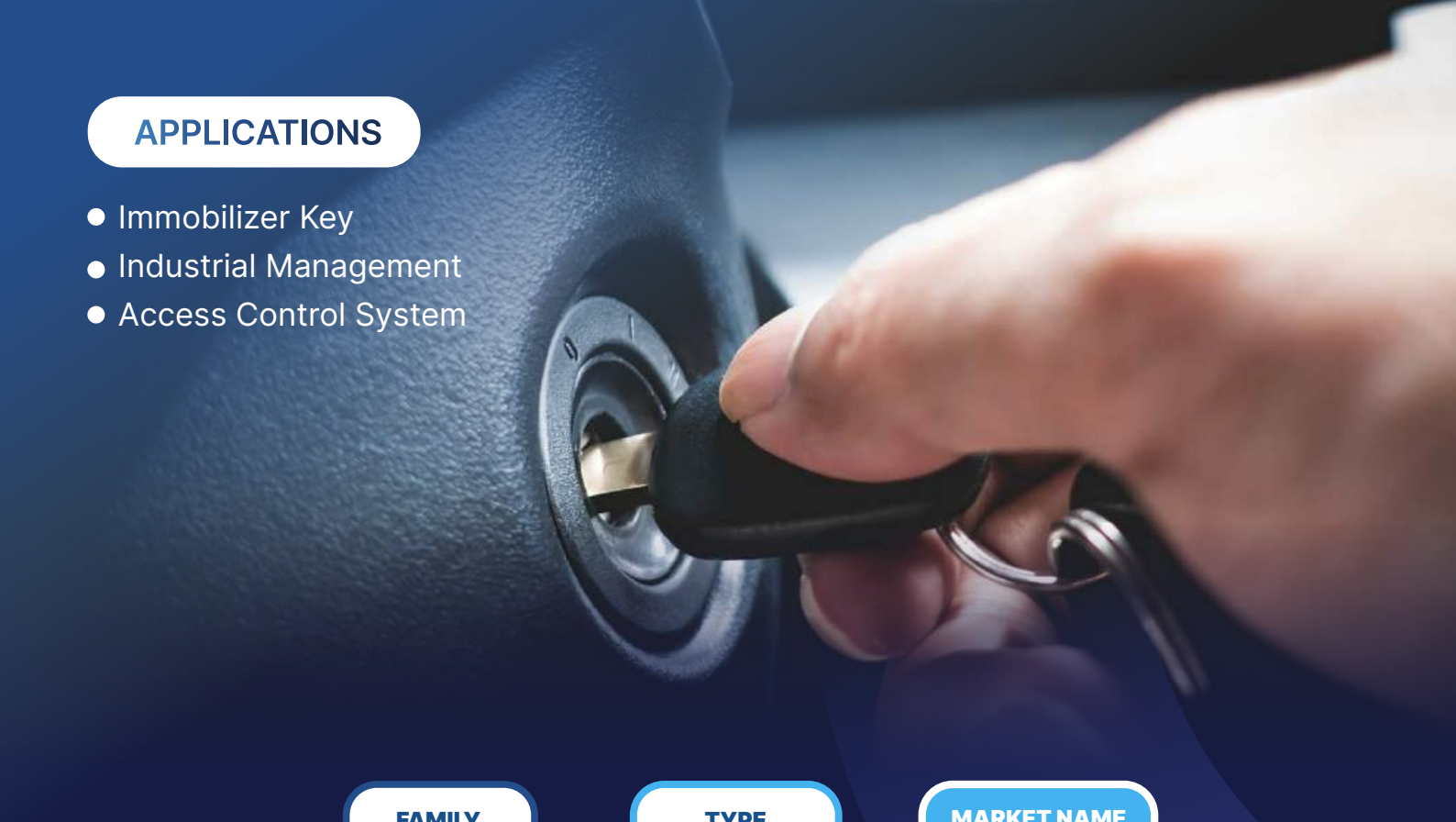
UNIVERSAL IMMOBILIZER KEY

SIC61AU is a universal immobilizer transponder for automotive keys, operating within the low-frequency (LF) range.
It supports four families of LF communication protocols:
A, N, S, and T, with 14 classical transponder types supported.



HIGHLIGHT FEATURES

- Universally support transponders in the market both HDX and FDX
- Best-in-class reading performance
- Compatible with 4 families and 14 types of conventional immobilizer transponder
- Simple step to transform transponder to each type
- High-Quality and robust transponder package
- Simplify transponders inventory management to handle fluctuating demand in car service center or locksmiths shop



APPLICATIONS

- Immobilizer Key
- Industrial Management
- Access Control System

SUPPORT PRODUCT FAMILY

FAMILY	TYPE	MARKET NAME
N	Full Duplex 125 kHz	ID46
		ID46 +EE
		ID46 Ext.
		ID47
		ID4A
		ID49
T	Half Duplex 134.2 kHz	ID4C
		ID4E
		ID4D
		ID8A
S	Full Duplex 125 kHz	T5
		ID48
A		ID88
		ID8C

ORDERING **INFORMATION**

Part No : PAUDW503EP0SUAU30C3

Description : SIC61AU-30 Universal immobilizer LF FDX & HDX with multiple encryption wedge 134.2/125kHz,Canister, RFID Tag

Package : Wedge (6.0 mm H x 3.0 mm W x 12.0 mm L, Standard size with OEM)

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ANIMAL ID

SIC7150
SIC278
SIC279

LF TRANSPONDER ICs
FOR ANIMAL IDENTIFICATION

SIC7150, SIC278, and SIC279 are low-frequency (LF) RFID transponder ICs are designed for a broad range of applications in animal identification. They operate at 134.2 kHz RFID, fully compliant with ISO 11784 and ISO 11785.

Low-frequency (LF) transponder ICs streamline animal handling, elevating the standard of livestock management while mitigating the risk of disease transmission. These transponder ICs also play a crucial role in the identification of pets and laboratory animals.

Silicon Craft's specialized chip design, integrated with proprietary intellectual properties (IPs), provides best-in-class read range performance. It also includes on-chip resonant capacitance tuning, which optimizes transponder communication capabilities and greatly enhances operational efficiency.

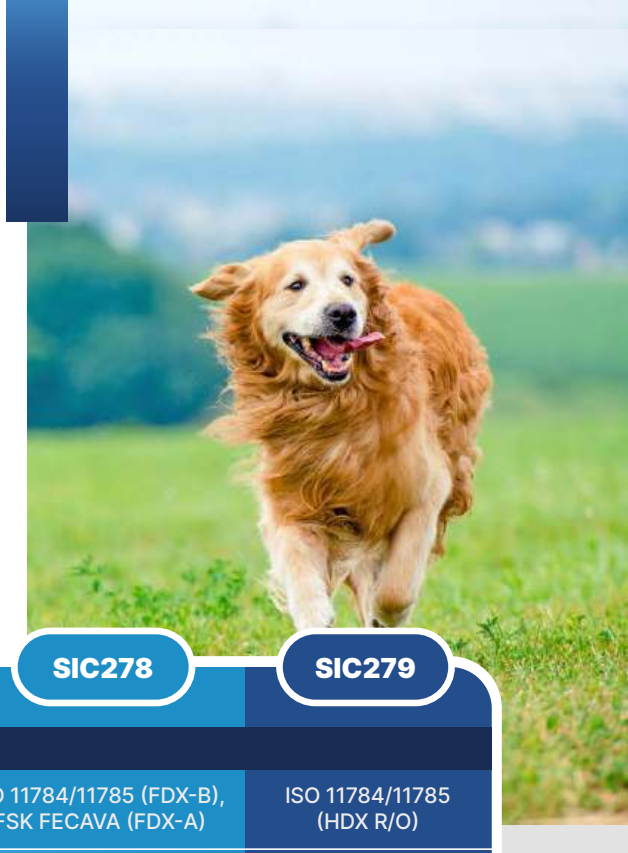
HIGHLIGHT FEATURES

- Meets ISO 11784/11785 and ICAR Standard for Animal Identification
- Support LF Transponders Used in Industrial Applications
- On-Chip Tunable Resonant Capacitor
- Best-in-Class Communication Distance

APPLICATIONS

- Livestock Identification
- Pet Identification
- Fish Identification
- Pigeon Identification
- Laboratory Animal Identification

LF TRANSPONDER ICs
FOR ANIMAL IDENTIFICATION APPLICATION



SIC7150
Transponder IC with
Full-Duplex (FDX-B)

SIC278
Transponder IC with
Full-Duplex (FDX-A/FDX-B)

SIC279
Transponder IC with
Half-Duplex (HDX R/O)

SPECIFICATION TABLE

SPECIFICATION	SIC7150	SIC278	SIC279
Communication			
Protocol	ISO 11784/11785 (FDX-B)	ISO 11784/11785 (FDX-B), FSK FECAVA (FDX-A)	ISO 11784/11785 (HDX R/O)
Reader Talk First	Yes		N/A
Memory			
User Memory Size [bits]	320	1,184	192
Data Retention [years]	10		20
Write Cycles [times]	100,000		
Security	Read and Write 32-bit Password Authorization		
Resonant Capacitor			
Integrated Resonant Capacitor [pF]	210, 250, 330	230	330
On-Chip Tunable Resonant Capacitor	Yes*		
Tunable Resonant Capacitance Range	±5%	±5%	±10%
Tunable Resonant Capacitance Data [steps]	32		128
Others			
Packages	Sawn Wafer, UDFN	Sawn Wafer, WDFN	VDFN, Glass Tag
Megapad for Direct Connection of Coil on Die	Yes		No

Remark [*]: Only Available for 330 pF

SUPPORT MATERIALS

- Silicon Craft Universal LF Reader
- PC Software for Tuning On-Chip Resonant Capacitance

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