



Access Control Key with World-Class Digital Security and Stainless-Steel Durability

*Computer Chip-Based Electronic Key
Fits on a Keyring and Lasts 10 Years*



Building Access

Biometric Data Carriers

Computer/Network Security

eCash Systems

Key Control Systems

Standalone Locks

POS Terminal Access

Time and Attendance Systems

Unique Solution for Access Control

What is an iButton?

An iButton® is a computer chip with a globally unique address, factory-lasered at time of manufacture (think of it as a URL for each iButton), enclosed in a 16mm stainless-steel case. iButtons can include read/write memory, real-time clocks, and temperature/humidity data loggers. They deliver or record data wherever needed. All this power and capability make iButtons ideal for a wide range of applications including access control, eCash transactions, asset tracking, and environmental data logging.

The Globally Unique Key— 281,000,000,000 Different Combinations!

An iButton's 64-bit address provides a simple, secure way of identifying a person or asset. It acts like your personalized "key" to protected information. When you present the correct key to a service control unit (SCU), the desired event (like the opening of a lock) is enabled. SCUs are microprocessors or any computing device handling authentication of a user token and validation of its data. Common SCUs are found inside door locks, POS terminals, or prepaid utility meters. This is why iButtons are perfect for various access control functions like access to buildings or computers, and authorizing vehicle or equipment operation.



The unique address uses 8 bits to identify the type of iButton and 48 bits to generate a serial number. That's enough numbers to make 50,000 keys for every person on the planet!

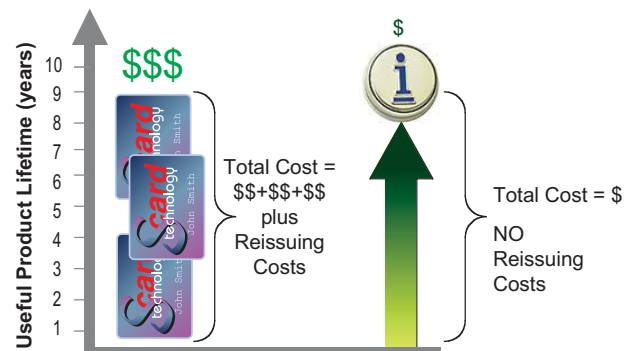
So Rugged It Lasts Forever!

iButtons bring unparalleled durability to access control applications. Sit on it, step on it, or drop it in water. There is no need to worry about destroying a key because iButtons can withstand harsh indoor or outdoor environments. The durable iButton is wear-tested to last a minimum of ten years, so you are not constantly replacing flimsy plastic access cards. For added convenience, they easily attach to a key fob, ring, or even a watch.

So Simple It Interfaces to Virtually Anything and Uses Almost No Energy!

iButtons require a physical/electrical connection to whatever is writing or reading data. However, a novel digital communication scheme called a 1-Wire® interface reduces the number of electrical contact points to just one, plus a ground reference. A single conductor for both power and data communications is all that is needed. Devices that read and write to iButtons seal all the electrical components inside and expose only the two electrical contact points, separated by a wide gap. With the connection so simplified, you get very durable, dust- and moisture-immune probes that interface to most surfaces.

An iButton reader draws virtually no power in standby mode and less than 2mA during communication—making it ideal for battery-powered devices such as electronic door locks. Reading an iButton's unique address takes no more than 10ms. A typical iButton lock can operate more than 60,000 openings on a set of four AA batteries. Now you will change batteries every few years instead of every few months.



iButtons are an exceptional value for security and durability. Every iButton delivers a minimum of 10 years of trouble-free performance. They can last up to 3 times as long as a smart card, which significantly reduces operating costs.

A Choice of Products for Any Security Need

The Address to Multiple Locations

The DS1990A, simplest of all iButtons, contains only the unique 64-bit ROM address. Because each lock or access-control system stores the address of each key, a user only needs one iButton for access to multiple locations or assets.

Memory to Store Critical Data

Access codes, authorization levels, and vital statistics are critical data you cannot risk. Most iButtons add programmable memory as either EPROM, EEPROM, or NV RAM, allowing you to retain possession of that critical data. To secure information stored in memory, data can be encrypted. By using the unique address during the encryption process, even higher levels of security are possible.

Memory with Time-Dependent Access

The DS1994 iButton has an on-board real-time clock that can be armed to expire at a future date and time. This feature can be used to disable access to data inside the iButton. Access can also be denied based on elapsed time (cumulative usage) or number of accesses.

Memory with Password-Protected Access

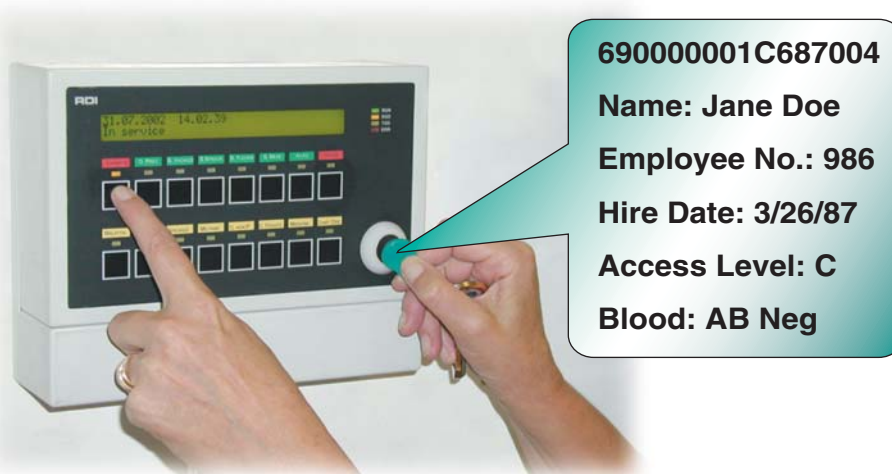
When you want to limit access to secure data, an iButton can require the host to know the password for any read or write operation. The DS1991 has three service data pages. Each 48-byte page has its own 64-bit access password and service ID. The DS1977 has 32kB of EEPROM memory. Access to the memory can be password protected with different passwords for read-only and full access.

EPROM (DS198x) iButtons are write-one-time, read-many-times devices. The memory can be written incrementally until it is completely full. EPROM devices are ideal for applications where the data never changes, like an employee's unalterable record of authorizations. Alternately, they can serve as an electronic "punch card." A system might grant up to 100 accesses to a machine. After each access, another memory location is irreversibly programmed. Once 100 locations are written, the key becomes invalid. EPROM iButtons also come in UniqueWare™ versions that have customer-specific data preprogrammed into them at the factory.

EEPROM (DS197x) iButtons allow users to read and write data to the device. You can store the access privileges of a user and update those privileges automatically as needed.

NV RAM (DS199x) iButtons are similar to EEPROM iButtons, but can be rewritten many more times. They are generally used for applications where data is updated frequently. In addition, the on-board lithium-energy source guarantees that memory updates, once initiated, are always completed because the power to finish the transfer is supplied by the lithium cell, not the reader/writer. This is important in the typical iButton environment where electrical contact can be intermittent.

UniqueWare is a trademark of Dallas Semiconductor Corp.



High-Level Authentication Thwarts Security Attacks

Memory for Challenge-and-Response Authentication

For even greater security we offer challenge-and-response secure memory iButtons based on the ISO 10118-3 standard hashing algorithm called Secure Hash Algorithm 1 (SHA-1). SHA-1 is the only hashing algorithm approved by the U.S. Government. A challenge-and-response system allows two parties to share a common secret, yet never reveal that secret during communication. This permits the safe exchange of secure data. An integrated 512-bit SHA-1 engine can be activated to compute 160-bit message authentication codes (MACs) based on information stored in the iButton. Typical applications include local (at door/entryway) or remote (across a network) authentication/access control, secure change purse for electronic payment at transit systems, pay phones, parking meters, or vending machines, and physical/computer access.

Challenge-and-response iButtons use proven algorithms and provide the best security features to thwart the most sophisticated attacks. These devices can defeat numerous known logical security attacks including copy attack, replay attack, eavesdrop attack, A-B-A attack, and emulation attack. For more details, refer to White Paper 8: *1-Wire SHA-1 Overview* at www.iButton.com

Simplified Key Management for all Security Levels

Regardless of which security level is selected for an access control system, the management of iButtons used as electronic keys is greatly simplified due to the globally unique, preprogrammed ROM ID that is never duplicated. Adding keys to (or removing them from) the existing population is quick and easy.

DS1961S—1kb EEPROM with SHA-1 engine

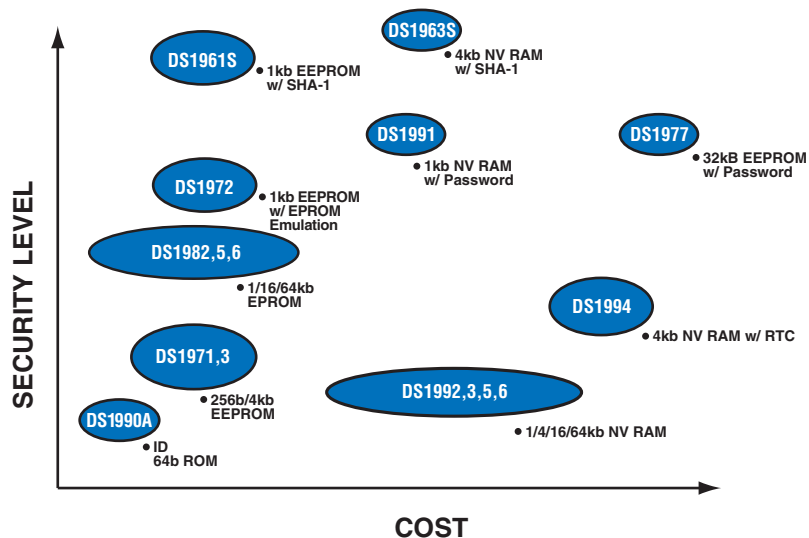
With 1kb of application memory, the DS1961S stores a single 64-bit secret that can be used in conjunction with the on-chip SHA-1 engine to prove its authenticity to an SCU. Likewise, the SCU is required to prove it is authentic before it is allowed to write data to the DS1961S. This security mechanism, called mutual authentication, is ideal for high-level security access control or eCash applications.

DS1963S—4kb NV RAM with SHA-1 engine

The DS1963S has 4kb NV RAM and supports up to seven different applications or service providers, each with their own 64-bit secret that is never revealed to other service providers. Special counters in this iButton ensure that previous or current data patterns, for example an authorization level or cash balance, cannot be extracted from the device and fraudulently rewritten later. Thus, the DS1963S treats every instance of data as unique. Additionally, NV RAM technology makes brute-force physical attacks virtually impossible.

iButton Products Security Continuum

iButtons are available in a wide variety of security levels to provide the most appropriate protection for your application.



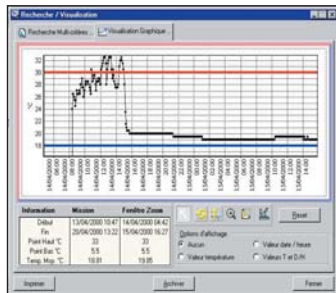
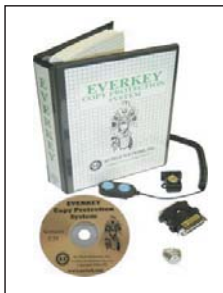
b - bits
kb - kilobits
kB - kilobytes

iButton Security Products Selection Guide

REQUIREMENTS	SUGGESTED PARTS	REMARKS
Need unique ID only.	DS1990A	Easiest to implement; ideal for simple systems such as locks. Typically the host would store the authorized key list inside the service control unit.
Need plain memory for permanent application data.	DS1982 DS1985 DS1986	Easy to implement, ideal where application data will not change once written to the user tokens. Each memory page can be write protected, and encryption of service data can be implemented on the host side optionally.
Need memory for service data. Can use plain memory because host provides data security protection.	DS1971 DS1973 DS1992L DS1993L DS1995L DS1996L	The host typically encrypts or hashes the service data so that it can be validated by hosts on the system. Use the device's unique address as one parameter to feed into the system's encryption or hashing computation. Improves resistance against "class-break."
Need memory for service data. Want to automatically disable the device at some future day/time.	DS1994L	An on-board real-time clock (RTC) can be armed to expire at a future day/time. Can be used to disable access to data inside the iButton. Access can be denied based on elapsed time (cumulative usage) or number of accesses. Provides an independent tamperproof clock.
Need write protected memory.	DS1972	Memory pages can be individually write protected or put in EPROM-emulation mode, where bits can only be changed from a 1 to a 0 state.
Need password-protected memory for user-access authorization.	DS1991L DS1977	Good security and easy to implement. Some customers further encrypt the service data with the device ID as one of the encrypting input parameters. The DS1991L can support three independent services.
Need challenge-and-response authentication. Want to protect against losing secret to interception.	DS1961S DS1963S	Offers higher security than static password approach. DS1961S supports four services that share the same access secret. DS1963S supports seven independent services with separate secrets.

Turnkey Systems Available

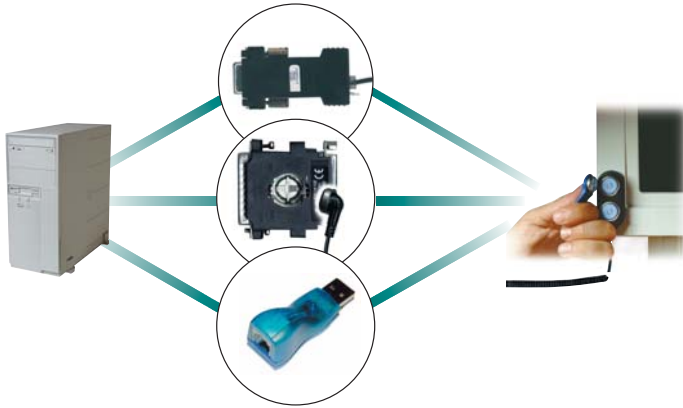
Our Authorized Solutions Developers (ASDs) have already developed turnkey iButton systems for many access-control needs. These developers can also design custom iButton software and/or hardware solutions. Review our partners and their products at www.iButton.com/solutions.



Interface Is Simple and Low Cost

One-Touch Interface

How do I communicate with an iButton? Interfacing an iButton to any type of electronics is easy. Information transfers between an iButton and a PC, PDA, a variety of handhelds, or a microcontroller with a momentary contact at up to 142kbps. Simply touch the iButton to a Blue Dot™ receptor or other types of mating probes.



For PCs, we provide low-cost adapters for serial, parallel, and USB ports.



A wide range of iButton readers for access-control applications are available from our third-party developers. Reference-driver circuits for building custom iButton adapters and readers are available on our website.

Free Software Development Tools

Free iButton and other 1-Wire software development kits address different platforms and programming language preferences. Multiple application notes and papers reduce the development burden and help ensure your success.

PLATFORM	RESOURCE	DESCRIPTION
Windows® 32 (XP, 2K, NT, ME, 98SE, 95)	1-Wire SDK*	Windows programming language-independent library. Supports all 1-Wire adapter types with traditional API* (TMEX) and Windows .NET (OW.NET) interfaces.
Windows 32 (XP, 2K, ME, 98SE)	Software Authorization	Portable 'C' library for software developers to control unauthorized use of programs. Supports serial, parallel, and USB 1-Wire adapters.
Any platform with a 'C' compiler	1-Wire Public Domain Kit	Portable 'C' library. Supports both a serial port plus DS2480B bridge or custom 1-Wire interface. Many 1-Wire adapter and platform-specific example builds provided.
Any Java™ platform (J2ME™ also available)	1-Wire API for Java	Portable Java library. Supports both a serial port plus DS2480B bridge or custom 1-Wire interface. All 1-Wire adapters supported on the Windows platform.
Microprocessor	<ul style="list-style-type: none"> • Application Note 126 (I/O port pin for 1-Wire) • Application Note 192 (Serial port + DS2480B bridge for 1-Wire) • Application Note 3684 (I2C‡ port plus DS2482) • Some I/O port assembly examples in 1-Wire Public Domain (PD) Kit 	Documentation to add a 1-Wire port to a microprocessor. Some assembly examples available. If the microprocessor has a 'C' compiler, the 1-Wire Public Domain code can be used.

*Refer to Application Note 155: 1-Wire Software Resource Guide for an overview of all available APIs. For all iButton application notes and software tools visit www.maxim-ic.com/ibutton. For support, contact autoinfo.support@dalsemi.com.

Blue Dot is a trademark of Dallas Semiconductor Corp.

Windows is a registered trademark of Microsoft Corporation.

Java and J2ME are trademarks of Sun Microsystems.

‡Purchase of I²C components from Maxim Integrated Products, Inc., or one of its sublicensed Associate Companies, conveys a license under the Philips I²C Patent Rights to use these components in an I²C system, provided that the system conforms to the I²C Standard Specification defined by Philips.













iButtons—More Than Just an Access Control Key

The iButton product family has over 20 different products to meet your application needs—access control, guard tour, eCash, maintenance and inspection, hardware and software authorization, and temperature and humidity data logging.

Product Quickview

	PART	DESCRIPTION		
Address Number Only	DS1990A	64-bit ROM ID		
NV RAM Memory	DS1992/3/5/6L	1kb/4kb/16kb/64kb NV RAM		
EEPROM Memory	DS1971/2/3/7	256-bit/1kb/4kb/32kB EEPROM		
EPROM Memory	DS1982/5/6	1kb/16kb/64kb EPROM		
Password-Protected Secure Memory	DS1991L/DS1977	Three 384-bit partitions NV RAM/One 32kB partition EEPROM		
Challenge-and-Response Secure Memory	DS1961S	1kb EEPROM with SHA-1		
	DS1963S	4kb NV RAM with SHA-1 and counters		
Real-Time Clock	DS1904/DS1994L	RTC/RTC with 4kb NV RAM		
Temperature Sensor	DS1920-F5	Enables user to collect current temperature upon contact with a reader. Digital thermometer, $\pm 0.5^{\circ}\text{C}$ accuracy (-55°C to $+100^{\circ}\text{C}$)		
Temperature Data Loggers	PART	TEMP RANGE	MAX ACCURACY	DATA LOG SIZE
	DS1921G-F5	-40°C to $+85^{\circ}\text{C}$	$\pm 1^{\circ}\text{C}$ ($-30^{\circ}\text{C}/+70^{\circ}\text{C}$)	2k points
	DS1921H-F5	$+15^{\circ}\text{C}$ to $+46^{\circ}\text{C}$	$\pm 1^{\circ}\text{C}$	2k points
	DS1921Z-F5	-5°C to $+26^{\circ}\text{C}$	$\pm 1^{\circ}\text{C}$	2k points
	DS1922L-F5	-40°C to $+85^{\circ}\text{C}$	$\pm 0.5^{\circ}\text{C}$ ($-10^{\circ}\text{C}/+65^{\circ}\text{C}$)	4k/8k points
DS1922T-F5	0°C to $+125^{\circ}\text{C}$	$\pm 0.5^{\circ}\text{C}$ ($+20^{\circ}\text{C}/+100^{\circ}\text{C}$)	4k/8k points	
Temperature/Humidity Data Logger	DS1923-F5	-20°C to $+85^{\circ}\text{C}$	$\pm 0.5^{\circ}\text{C}$, 5%RH	4k/8k points

Accessories Quickview

COMM. PORT ADAPTERS		
	DS9490R	1-Wire USB Adapter: 1-Wire to USB interface. Connects to all reader/probes with RJ-11 interface.
	DS9490B	USB iButton Holder/Dongle: 1-Wire to USB interface. Designed for applications in which iButton is infrequently removed from holder.
	DS9097U-S09/009/E25	Universal 1-Wire COM Port Adapter: 1-Wire to RS-232 COM port interface (DB9). Connects to all reader/probes with RJ-11 interface. 009 version includes DS2502 for ID. E25 version includes a 12V power port for writing to EPROM iButtons and comes in a DB25 package.
	DS1410E-001	1-Wire Parallel Port Adapter: 1-Wire to parallel port interface. Insert iButton directly or use with DS1402D-DB8 or DS1402BP8.
PROBES/RECEPTORS (READER/WRITER INTERFACES)		
	DS1402D-DR8/DB8	Blue Dot Receptor Cable: iButton read/writer interface. iButtons communicate through Blue Dot interface with just a touch or can be snapped into the Blue Dot for continuous connection. DR8 has RJ-11 interface. DB8 has button interface.
	DS1402RP8/BP8	iButton Touch and Hold Probe Cable: iButton read/writer interface. iButtons communicate through probe with just a touch or can be snapped into the probe for continuous connection. DR8 has RJ-11 interface. DB8 has button interface.
	DS9092GT	iButton Handheld Wand: Plastic wand with an integrated iButton probe, shaped to self-align with iButtons. Gives tactile feedback. The wand comes with a 10cm handle and a 1m cable that is terminated with an RJ-11 jack.
	DS9092/T/L	Panel Mount Probe. T version has tactile feedback. L version has LED and is recommended for outdoor use.
	DS1402D-041	Blue Dot probe component for embedded touch and hold applications.
iBUTTON MOUNTS		
	DS9093Ax/F/N	Key Fobs: Allow an iButton to be carried conveniently on a key chain. Available in three different versions and five different colors.
	DS9093S/P	Wall Mounts: Allows you to securely mount iButtons to most surfaces. Available in two versions.
	DS9096P	iButton Adhesive Pads. Allow you to easily mount iButtons to anything.

iButton®

Touch the Future!



WHAT'S NEW?

Overview

- What is an iButton?
- Applications
- Brochures
- Videos
- Photo Library

iButtons

- ID Only
- Memory
- Real-Time Clock
- Secure
- Sensor
- Data Logger

Accessories

- Adapters
- Readers and Probes
- Mounting Options
- Starter Kits

Sales

- Direct
- Buy Online
- Partners
- Distributors
- Samples
- Trade Shows

Solution Partners

- Solutions Search
- Become a Partner

Contact Us

- Contacts and Support
- Sales Information

Software Resources

- Software Development Kits
- Software Search Engine
- 1-Wire Drivers
- OneWireViewer Demo

Technical Support

- Data Sheets
- Application Notes
- FAQs
- Discussion Groups
- E-mail Updates

Visit Our Website to Find the Latest Information on iButtons
www.ibutton.com



Corporate Headquarters
Maxim Integrated Products
120 San Gabriel Dr.
Sunnyvale, California 94086
1-888-maxim-ic
www.maxim-ic.com

Dallas Semiconductor
iButton Product Group
4401 Beltwood Parkway
Dallas, Texas 75244
Phone: 1-888-maxim-ic
FAX: 972-371-3715
www.iButton.com

Get started today
with our DS9092K
iButton Starter Kit.