



# 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 Security*

*Key Control Systems*

*Standalone Locks*

*POS Terminal Access*

*Time and Attendance Monitors*

*Voting 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, clocks, thermometers and 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!

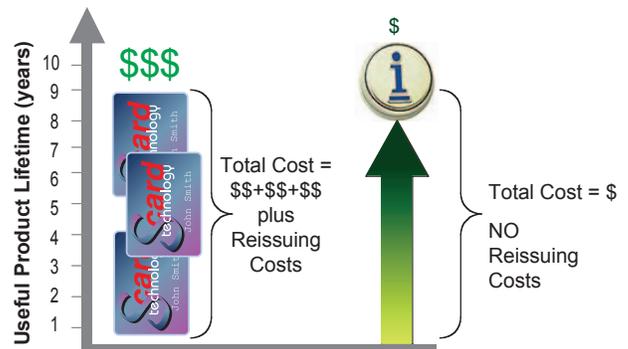
## So Rugged It Lasts Forever!

iButtons bring unparalleled durability to access control applications. Sat on it? Stepped on it? Dropped 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.

*iButton is a registered trademark of Dallas Semiconductor.  
1-Wire is a registered trademark of Dallas Semiconductor.*

# 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. Additionally, an unprotected 64-byte scratchpad memory serves as an intermediate buffer. Copying data from the scratchpad to the appropriate secure memory page (assuming the correct password has been supplied) makes the write operation highly reliable in the presence of intermittent connections.

**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, EEPROM memory lets an iButton serve as an electronic "punch card." A system might grant up to 100 accesses to a piece of equipment. After each access, another memory location is irreversibly programmed. Once 100 locations are written, the key is no longer valid.

**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.



**690000001C687004**

**Name: Jane Doe**

**Employee No.: 986**

**Hire Date: 3/26/87**

**Access Level: C**

**Blood: AB Neg**

# 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 an ISO 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 [www.iButton.com](http://www.iButton.com).

## Memory with Java-Powered Cryptography

For your highest level security needs we offer the Java™-powered cryptographic iButton. It contains a Java Card 2.0-compliant virtual machine, and is NIST validated for conformance to FIPS PUB 140-1. Using PKI challenge/response authentication you can grant access privileges to information on web pages. Even sign and approve documents so others can be assured of their origin.

Java-powered iButtons come in two versions:

- DS1955—6kB NV RAM
- DS1957—134kB NV RAM

*Java is a trademark of Sun Microsystems.*

### DS1961S—1kb EEPROM with SHA-1 engine

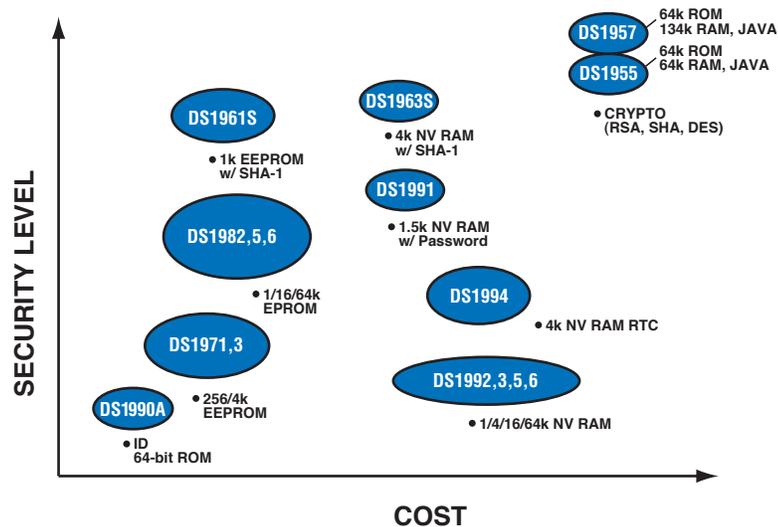
With 1kb of application memory, the DS1961S stores a single 64-bit secret that can be used in conjunction with the on-chip SHA-1 engine to prove its authenticity to an SCU. Likewise, the SCU is required to prove it is authentic before it is allowed to write data to the DS1961S. This security mechanism, 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.

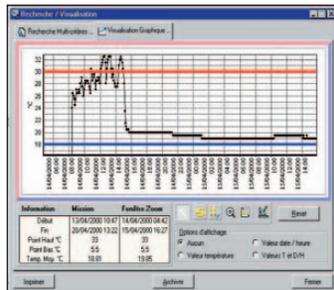
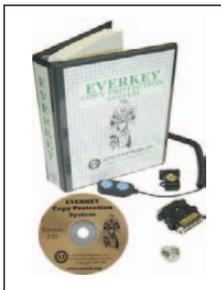


# iButton Security Products Selection Guide

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. 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 DS1992 DS1993 DS1995 DS1996	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.	DS1994	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 password-protected memory for user-access authorization.	DS1991L	Good security and easy to implement. Some customers further encrypt the service data with the device ID as one of the encrypting input parameters. A single device 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.
Need strong encryption support (1024-bit key). Need PKI support.	DS1955 DS1957	The highest level of security available.

## 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](http://www.iButton.com/solutions).

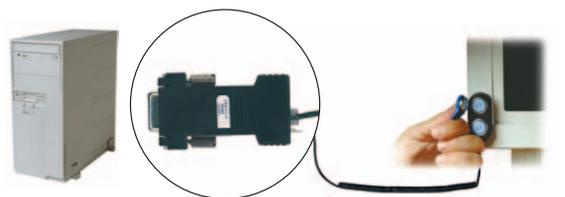


# Interface Is Simple and Low Cost

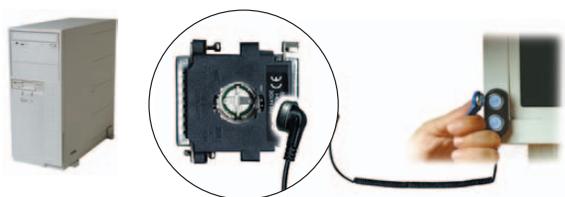
## One-Touch Interface

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, or microcontroller with a momentary contact, at up to 142kbps. Simply touch the iButton to a Blue Dot™ receptor or probe, which is connected to a port adapter. We provide low-cost adapters for both serial and parallel ports, with USB support coming soon.

Connecting to a serial port:



Connecting to a parallel port:



Perhaps your application is unusual? Unique? Let us help you design a reliable iButton reader and system. We offer free reference-driver circuits for building custom iButton adapters or readers. Visit [www.ibutton.com](http://www.ibutton.com) for circuit details and application notes.

## 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-bit (95, 98, NT, 2K, ME, XP)	1-Wire SDK	Programming-language-independent library supports all 1-Wire adapter types with traditional API* (TMEX) and Windows COM interfaces.
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.
Any Java platform	1-Wire API for Java	Portable Java library. Supports both a serial port plus DS2480B bridge or custom 1-Wire interface.
Microprocessor	<ul style="list-style-type: none"> <li>• Application Note 126 (I/O port pin for 1-Wire)</li> <li>• Application Note 192 (Serial port + DS2480B bridge for 1-Wire)</li> <li>• Some I/O port assembly examples in 1-Wire Public Domain (PD) Kit</li> </ul>	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 and 1-Wire software kits, visit our website at [www.ibutton.com/software](http://www.ibutton.com/software).

Blue Dot is a trademark of Dallas Semiconductor.  
Windows is a registered trademark of Microsoft Corporation.

# iButtons—More Than Just An Access Control Key

The iButton product family has over 20 different products that meet all application needs—access control, guard tour monitors, eCash, maintenance and inspection data management, device and software authorization, and temperature data logging.

## Product Quickview

	PART	DESCRIPTION
Address Number Only	DS1990A	64-bit ROM ID
NV RAM Memory	DS1992/3/5/6L-F5	1kb/4kb/16kb/64kb NV RAM
EEPROM Memory	DS1971/3	256-bit/4kb EEPROM
EPROM Memory	DS1982/5/6	1kb/16kb/64kb EPROM
Password-Protected Secure Memory	DS1991L	Three 64-byte password-protected secure memory pages
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	Digital thermometer, 0.5°C accuracy (-55°C to +100°C)
Temperature and Time Data Logger	DS1921L-F52/53	Thermochron® time/temp. data logger (-20°C (F52), -30°C (F53) to +85°C) 2k data points, ±1°C accuracy, 0.5°C resolution, 63 histogram bins.
	DS1921H-F5	High-resolution Thermochron time/temp. data logger (+15°C to +46°C) 2k data points, ±1°C accuracy, 0.125°C resolution, 64 histogram bins
	DS1921Z-F5	High-resolution Thermochron time/temp. data logger (-5°C to +26°C) 2k data points, ±1°C accuracy, 0.125°C resolution, 64 histogram bins.

Thermochron is a registered trademark of Dallas Semiconductor.

## Accessories Quickview

	PART	DESCRIPTION
	DS9097U-009	Universal serial-port adapter: 1-Wire to RS-232 COM port interface. Includes DS2502 for ID. Use with DS1402D-DR8.
	DS9097U-S09	Universal serial-port adapter: 1-Wire to RS-232 COM port interface. Same as DS9097U-009 without DS2502. Use with DS1402D-DR8.
	DS9097U-E25	Universal serial-port adapter: 1-Wire to RS-232 COM port interface (DB25). Supports programming EPROM-based iButtons. Use with DS1402D-DR8.
	DS1410E-001	Parallel-port adapter. Use with a DS1402D-DB8 or insert iButton directly.
	DS1411	Serial-port iButton holder. Use with a DS1402D-DB8 or insert iButton directly.
	DS1402D-DR8	8ft coiled cable: Blue Dot receptors on one end provide snap-in iButton contact for touch or dwelled communication and an RJ-11 connector on the other end of the cable.
	DS1402D-DB8	8ft coiled cable: Blue Dot receptors on one end provide snap-in iButton contact for touch or dwelled communication and a button-shaped connector on the other end of the cable.
	DS9092	iButton panel-mount probe. Solid-faced metal read head provides electrical contact for iButton data transfer.
	DS9092T	iButton tactile feedback, panel-mount probe. Read head with tactile feedback provides electrical contact for iButton data transfer.
	DS9092GT	iButton 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.
	DS9092L	High-durability iButton probe with LED. Provides electrical contact for iButton data transfer. Solid metal shape self-aligns with iButtons. LED for user feedback is housed in center contact. Recommended for outdoor use.
	DS9093A	iButton key fobs allow an iButton to be carried conveniently on a key chain. Five colors are available: black (DS9093A), red (DS9093A-R), blue (DS9093A-B), yellow (DS9093A-Y), and green (DS9093A-G).
	DS9490B/R	USB port adapter plus iButton holder (DS9490B) or USB port adapter plus RJ-11 connection (DS9490R). Available after July 2003.



**iButton®**  
Touch the Future!

简体中文 CHINESE  
日本語 JAPANESE

## WHAT'S NEW?

### iButton Overview

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**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