

# 1-WIRE PRODUCTS

## MIXED-SIGNAL DESIGN GUIDE

Data Sheets

Applications Notes

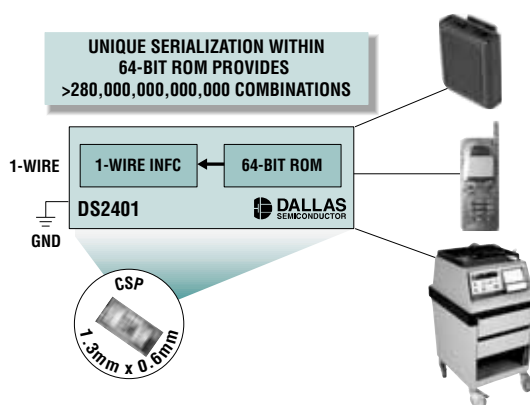
Free Samples

1st EDITION

## World's Smallest Globally Unique Electronic Serial Number

Use the DS2401 to bind unique electronic identification to the device, PCB, or system to which it is attached. Each device is factory-lasered with a unique and unalterable 64-bit serial number and is powered and communicated with over the single-contact 1-Wire® interface. The 1-Wire protocol is simple to implement and can be easily accomplished with a spare processor port pin. The 1-Wire protocol and commands also enable multiple DS2401s and/or other 1-Wire devices to coexist on a common 1-Wire network.

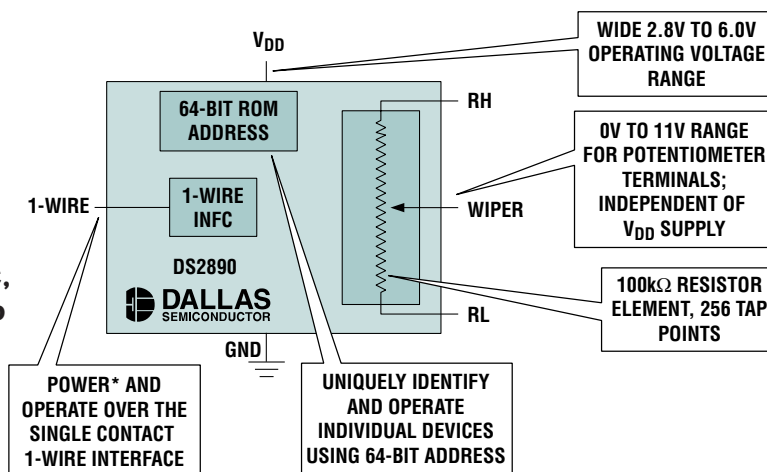
- **Fully 1-Wire Network-Compatible**
- **Exceptional ESD Performance:**  
**>±8kV Human Body Model**
- **2.8V to 6.0V, -40°C to +85°C**  
**Operating Range**
- **Packages Include TO-92,**  
**6-Pin TSOC, and CSP**



NEW  
PRODUCTS

## First Digital Pot to Support 11V Terminal Voltages While Operating from 2.8V Supply

- **Fully 1-Wire Network-  
Compatible**
- **2.8V to 6.0V,**  
**-40°C to +85°C**  
**Operating Range**
- **Available in 6-Pin TSOC,**  
**TO-92, and 6-Bump Flip**  
**Chip Packages†**



\*Modified devices characteristics in 1-Wire only power mode.  
†Contact factory for availability.

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DALLAS  
SEMICONDUCTOR

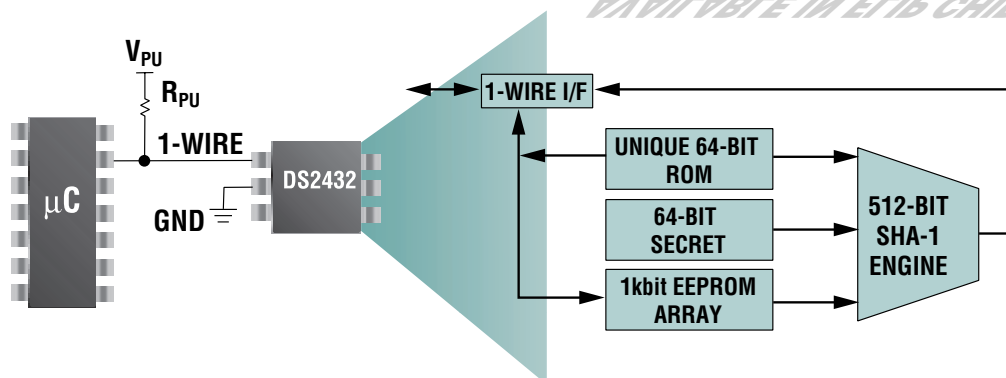
MAXIM

# World-Class Security in a Low-Cost EEPROM

## Computes 160-Bit SHA-1 Results in 1ms

The DS2432 1-Wire 1kbit EEPROM provides world-class security in the form of the U.S. Government-developed Secure Hash Algorithm (SHA-1) for challenge/response protection of stored data. The features of the DS2432 and security of SHA-1 provide a low-cost method to electronically protect intellectual property, enable after-market control for high-volume consumables, implement small electronic pay systems, or create tamper-proof data carriers. The DS2432 can also facilitate a means for two remote, independent systems to authenticate themselves to each other and safely exchange data across public networks.

**AVAILABLE IN FLIP CHIP!**



- **Operating Power Derived Entirely from the 1-Wire Bus**
- **Wide Operating Range: 2.8V to 5.25V, -40°C to +85°C**

**Additional Uses for 1-Wire EEPROMs Include:**

- **PCB Identification**
- **System Autoconfiguration of Multi-Board or Modular Systems**
- **IEEE 1451.4 Transducer Electronic Data Sheets (TEDS)**

PART	EEPROM MEMORY	PACKAGE
DS2432	1kbit SHA-1 Secured	6-Pin TSOC, 8-Bump Flip Chip
DS2430A	256-bit + 64 Lockable Bits	T0-92, 6-Pin TSOC, 4-Bump Flip Chip
DS2433	4kbit	PR35, 8-Pin SOIC, 6-Bump Flip Chip
DS2408*	1kbit + 8 Channels Programmable I/O	16-Pin SOIC, 12-Bump Flip Chip

\*Future product — contact factory for availability.

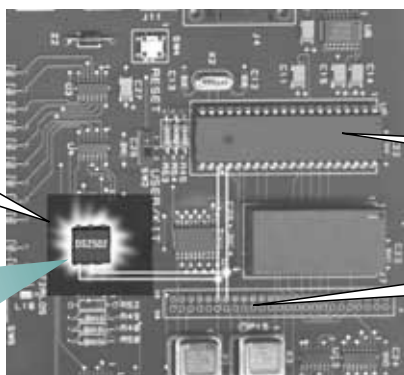
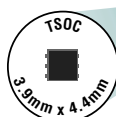
# The Ultimate Digital Label for the Digital Environment

With embedded memory and factory-administered 64-bit serialization, the DS250x series of 1-Wire add-only memories provides the ultimate electronic solution for PCB/product labeling and storage of product information. Write-once, read-many EPROM memory technology ensures critical data cannot be altered once it is programmed. Storage of product characteristics, PCB hardware/software revision, maintenance records, and calibration constants are examples of typical usage.

**ALSO AVAILABLE:  
FACTORY PROGRAMMING OF  
EPROM DATA (UniqueWare)  
AND UNIQUE CUSTOMIZATION  
OF THE 64-BIT ROM ID**

**STORE UNIQUE INFORMATION:**

SERIAL#: 00000F7182E4  
SUPPLIER ID#: 02  
HARDWARE REV: 1A  
SOFTWARE REV: 0102  
BUILD DATE CODE: 0132  
REWORK COUNT: 00



**PCB PROCESSOR  
ACCESSES HW REV  
DATA IN LABEL TO  
CONFIGURE SOFTWARE**

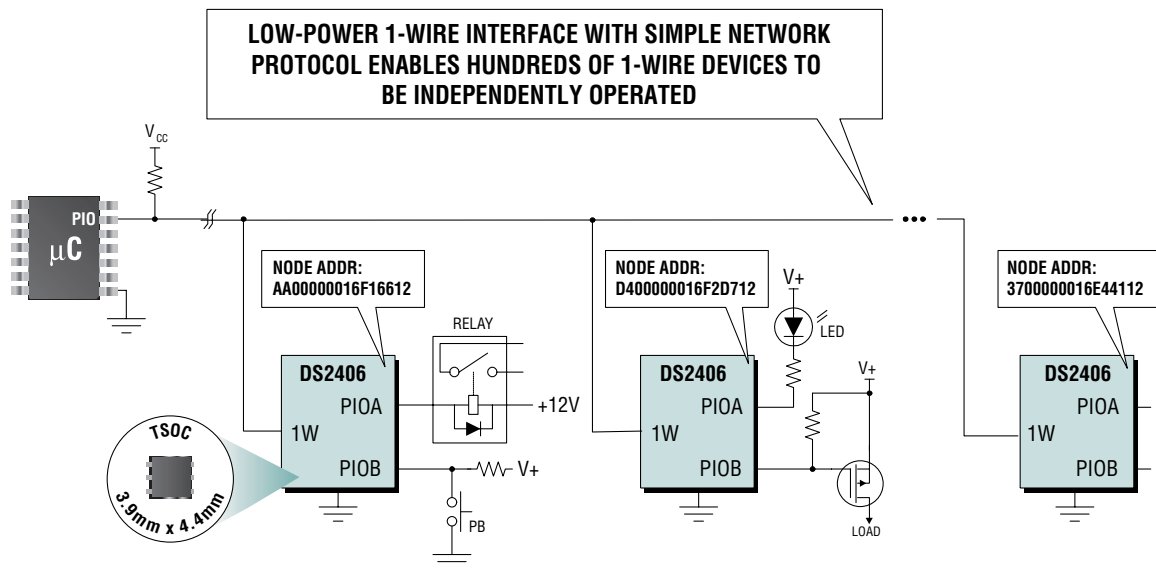
**EASILY ACCESS LABEL  
DATA DURING  
MANUFACTURING/TEST  
WITHOUT PCB POWER**

- **1-Wire Operation for Both Programming and Reading EPROM**
- **Unique, Factory-Lasered 64-Bit ID**
- **Memory Organized into 256-Bit Pages with Provisions for Individual Page Write Protection**
- **Strict Read/Write Protocol with Intermediate Scratchpad Ensures Integrity of Data Transfer**
- **Wide Operating Range:**
  - 2.8V to 6.0V Read
  - 12V @10mA Write
  - -40°C to +85°C Operation

PART	MEMORY	PACKAGE
DS2502	1kbit	TO-92, 6-Pin TSOC, 8-Pin SOIC, 2-Bump CSP
DS2505	16kbit	TO-92, 6-Pin TSOC
DS2506	64kbit	PR35, 8-Pin SOIC

# Control/Monitor Hundreds of Nodes with a Single Port Pin

Significantly simplify the design of remote system control and monitoring functions with 1-Wire programmable I/O devices. Bidirectional data flow enables both open and closed-loop control. Embedded memory can be used to describe a physical location, identify the controlled equipment, calibrate a sensor, or facilitate system autoconfiguration. The DS2409 is used to manage large 1-Wire networks by partitioning the net into individually controllable branches.



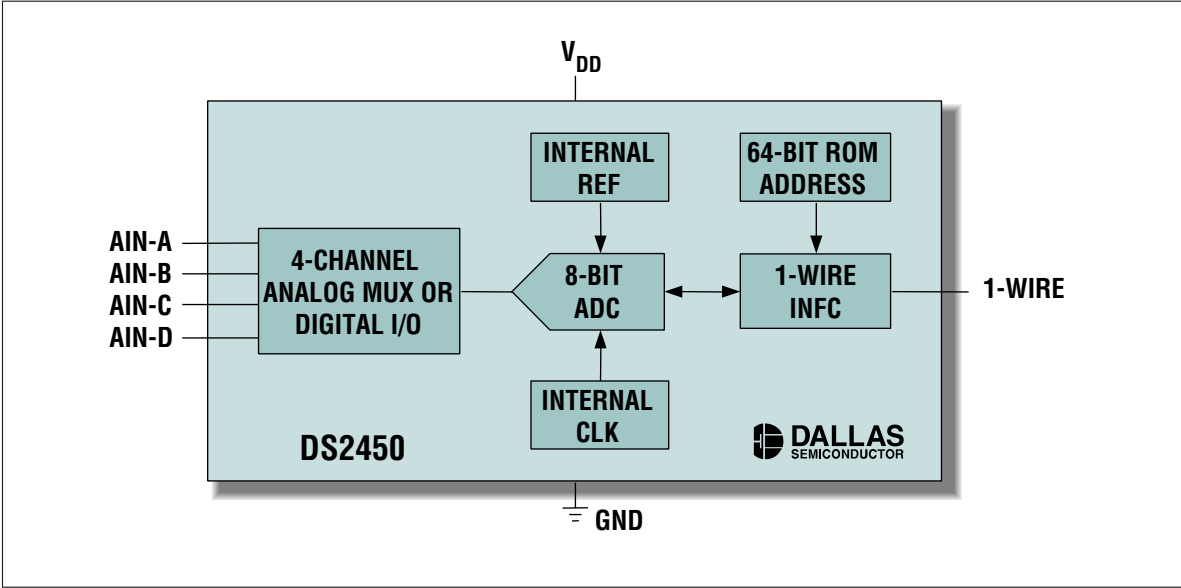
- **Dual Open-Drain PIO Channels**
- **Each Part has Unique Factory-Lasered 64-Bit ROM Address**
- **PIO-A: 13V/50mA, PIO-B: 6.5V/8mA**
- **Input Latches to Capture External Asynchronous Events**
- **1024 Bits of OTP EPROM**
- **Optional V<sub>CC</sub> Pin to Maintain Device State in Absence of 1-Wire Power**
- **2.8V to 6.0V, -40°C to +85°C Operating Range**

PART	I/O	DATA MEMORY	PACKAGE
DS2405	1-Channel PIO	N/A	T0-92, 6-Pin TSOC, SOT-223
DS2406	2-Channel PIO	1kbit EPROM	T0-92, 6-Pin TSOC, 6-Bump Flip Chip
DS2408*	8-Channel PIO	1kbit EEPROM	16-Pin SOIC, 12-Bump Flip Chip

\*Future product — contact factory for availability.

# 1-Wire A/D Products Set New Standards for Feature Integration and Interface Efficiency

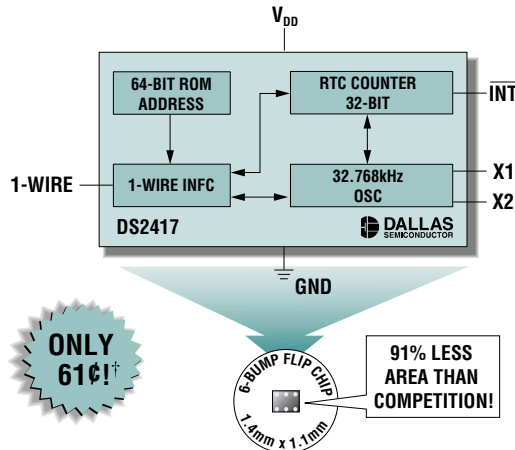
Convert Any Analog Sensor to a Digital Instrument



- **Total Unadjusted Error:**  
0.5LSB at 8 Bits
- **Unused Analog Inputs are Configurable as Digital Outputs**
- **Programmable Range Alarms for Each Analog Input**
- **Single Supply 5V Operation**  
over -40°C to +85°C
- **Each Part has Unique, Factory-Lasered 64-Bit ROM Address**
- **Low Power: 500µA Operating, 5µA Idle**

PART	RESOLUTION	PROGRAMMABLE I/O	DIGITAL THERMOMETER	ELAPSED TIME COUNTER	EEPROM USER MEMORY	SRAM USER MEMORY	PACKAGE
DS2450	8-Bit	✓					8-Pin SOIC
DS2438	Range Input (10-Bit for Full, 10-Bit + Sign for ±250mV)		✓	✓	✓		8-Pin SOIC
DS2760	Range Input (10-Bit for Full, 12-Bit + Sign for ±64mV)	✓	✓		✓	✓	16-Pin TSSOP, 18-Bump Flip Chip

# Lowest Cost RTC Has Smallest PCB Footprint, Lowest Power Consumption

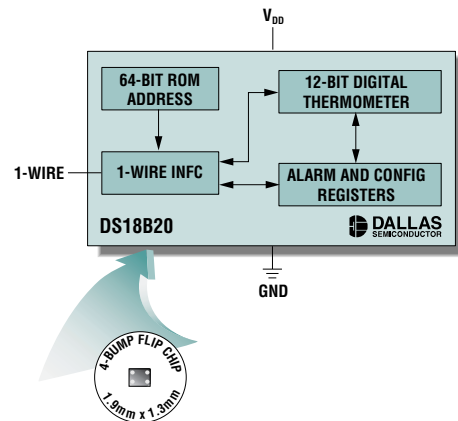


- $\pm 2$  Min/Month Clock Accuracy @25°C with External 32.768kHz Crystal
- Periodic Interrupt Output with Programmable Rates
- 250nA Max Operating Current @3.3V, 50% Less than Competitive Solutions
- 4kbit NV RAM (DS2404/DS2423 Only)
- Wide Operating Range: 2.8V to 5.5V, -40°C to +85°C

PART	POWER CYCLE COUNTER	INTERVAL COUNTER	RTC ALARM INTERRUPT	POWER CYCLE INTERRUPT	INTERVAL INTERRUPT	PERIODIC INTERRUPT	DUAL EVENT COUNTER	USER MEMORY	PACKAGE
DS2417						✓			6-Pin TSOC, 6-Bump Flip Chip
DS2415									6-Pin TSOC, 6-Bump Flip Chip
DS2404	✓	✓	✓	✓	✓	✓		✓	16-Pin TSSOP, 16-Pin SOIC, 16-Pin DIP
DS2423							✓	✓	6-Pin TSOC

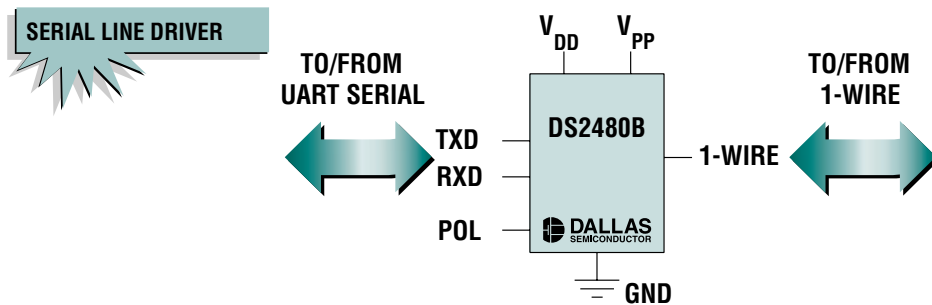
## First 1-Wire Digital Temp Sensor with $\pm 0.5^\circ\text{C}$ Accuracy

- Extended Temperature Measurement Range: -55°C to +125°C
- Accuracy Over -10°C to +85°C Range
  - DS18B20:  $\pm 0.5^\circ\text{C}$
  - DS1822, DS18B20x:  $\pm 2.0^\circ\text{C}$
- Thermal Alarm Function with Nonvolatile User-Programmable Trip Points
- 2x Lower Error than the Competition
- Packages Include TO-92, 150-mil 8-Pin SOIC, and Flip Chip
- Conversion Resolution User Configurable from 9 to 12 Bits

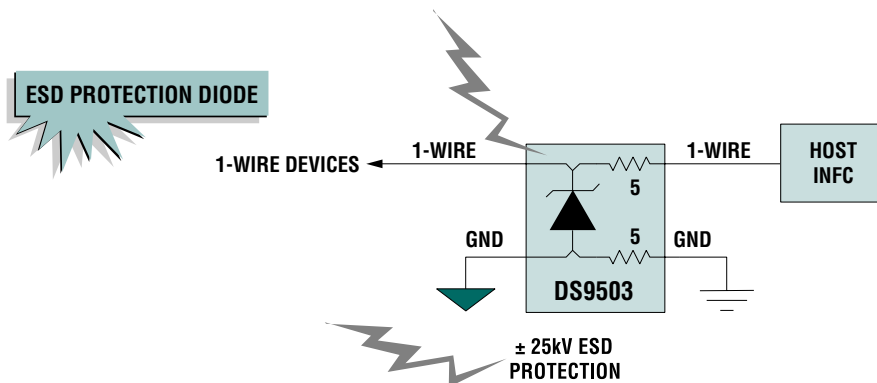


†10k pc. resale, FOB US

# Interface Products to Enhance and Simplify Your 1-Wire Design



- **Conversion Bridge Between UART/RS232 and 1-Wire**
- **Relieves Host from 1-Wire Waveform Timing Tasks**
- **Provides Regular, Flexible, and Overdrive 1-Wire Timing**
- **Supports Standard UART Transmission Rates**
- **Operating Range: 5V, -40°C to +85°C**



- **Zener Characteristic with Voltage Snap-Back to Protect Against ESD Events**
- **30nA Max Leakage, 40pF Junction Capacitance**
- **Compatible with all 3V/5V Logic Families**
- **Operating Range: -40°C to +85°C**

PART	FUNCTION	PACKAGE
DS2409	1-Wire Network Partitioning (Main/Aux Branches)	6-Pin TSOC
DS2480B	UART Serial (RS-232) to 1-Wire Conversion	8-Pin SOIC
DS2490	USB to 1-Wire Conversion	24-Pin SOIC, 26-Bump Flip Chip
DS9502	ESD Protection Diode	6-Pin TSOC, 4-Bump Flip Chip
DS9503	ESD Protection Diode with Resistors	6-Pin TSOC, 4-Bump Flip Chip