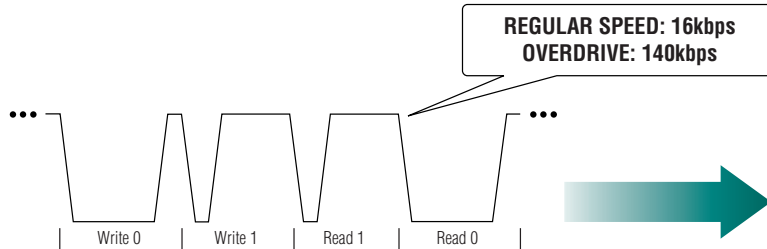


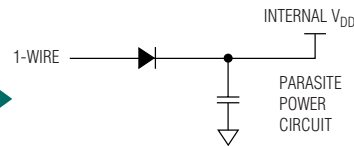


1-Wire Products Add Memory and Mixed-Signal to Your System with a Single Contact

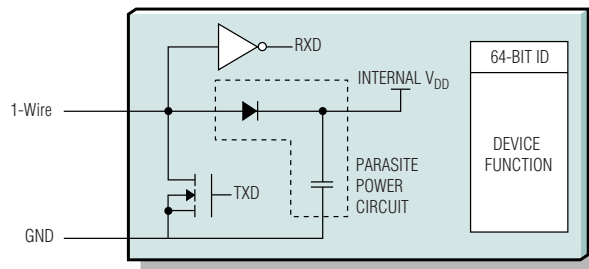
How Does 1-Wire® Work?



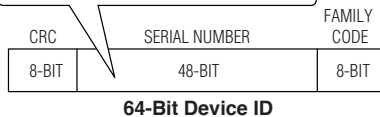
1-Wire WAVEFORM: VARIABLE PULSE-WIDTH SERIAL COMMUNICATION FOR DATA I/O



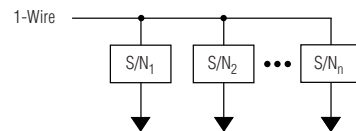
CHARGE CAPTURE DURING HIGH PERIOD OF 1-Wire WAVEFORM, STORED FOR DEVICE POWER DURING LOW PERIODS



>281 x 10¹² NUMBER POOL WITH 48-BIT SERIALIZATION



EACH DEVICE IS FACTORY LASERED WITH A UNIQUE AND UNALTERABLE 64-BIT ID. IT CAN BE USED FOR END-PRODUCT SERIALIZATION



THE UNIQUE ID IS ALSO USED TO IDENTIFY AND OPERATE INDIVIDUAL DEVICES IN A MULTIDROP ENVIRONMENT

LOOK INSIDE FOR

- Using 1-Wire to Identify Accessories and Sensors
- Latest 1-Wire EEPROM Products
- Secure Product or System Authentication with 1-Wire Memory
- New I²C™ 1-Wire Line Drivers
- Configuring and Monitoring Rack-Based Systems with 1-Wire

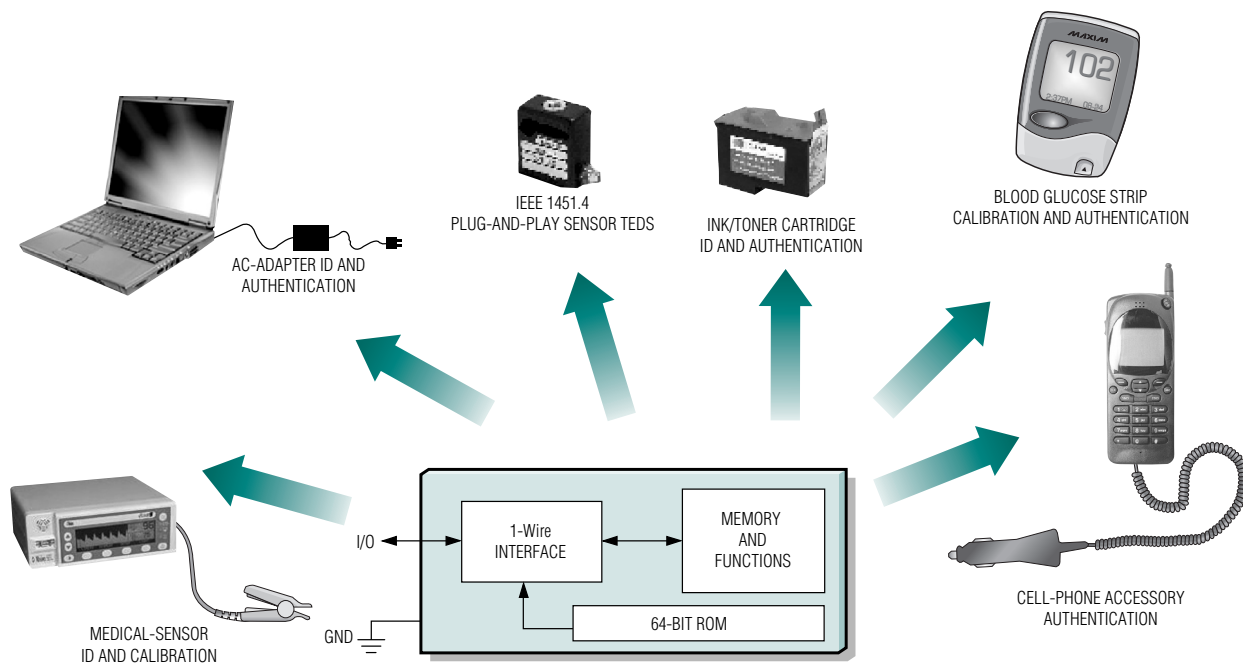
1-Wire is a registered trademark of Dallas Semiconductor Corp. Purchase of I²C components from Maxim Integrated Products, Inc., or one of its sublicensed Associated Companies, conveys a license under the Philips I²C Patent Rights to use these components in an I²C system, provided that the system conforms to the I²C Standard Specification as defined by Philips.

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Identify, Authenticate, and Control Accessories and Sensors with 1-Wire

The requirement to electronically identify, securely authenticate, or control sensors, accessories, and peripherals of electronic systems is driven by a variety of factors. Identification enables the host system to automatically calibrate or operate in a mode appropriate to the attached sensor or accessory. Secure authentication ensures reliability, safety, and quality of system operation, which can be undermined by low-quality OEM “knock-off” products. Control features in the accessory or peripheral enable the host system to activate modes or indicators that can provide visual feedback to the user. Spare connector pins between the host system and accessory are typically a constraint that makes adding this control capability—without increasing connector complexity and cost—a challenge. The 1-Wire product line provides solutions for all these requirements and enables implementation with a single, dedicated connector contact.



1-Wire Devices Commonly Used for Accessory and Sensor Applications

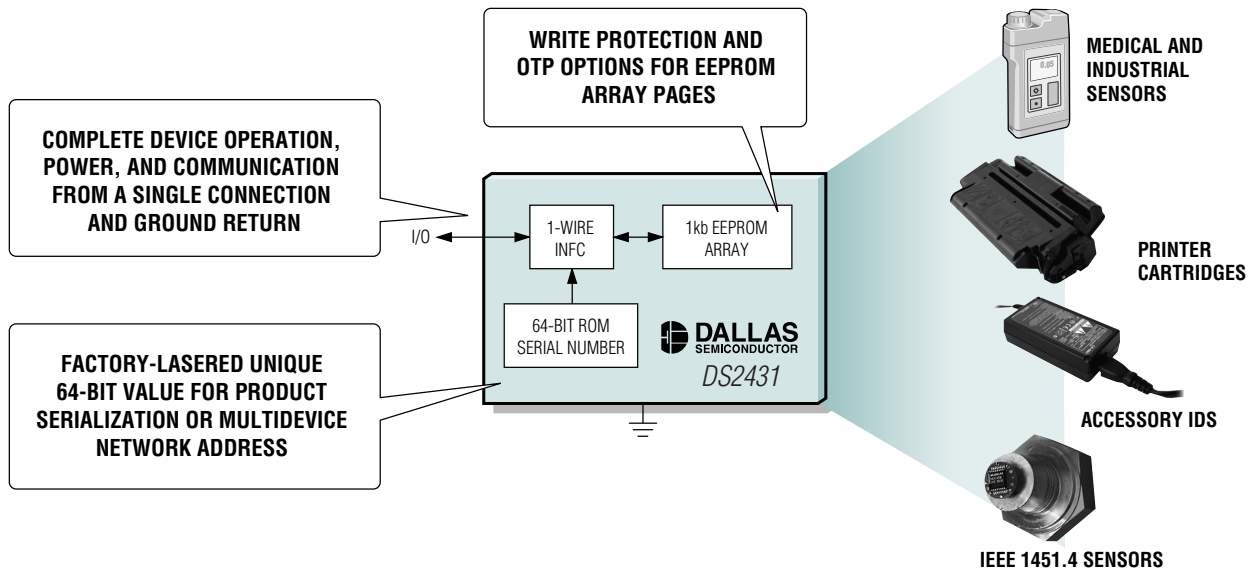
Part	Memory Type	Memory Size (Bits)	Additional Features	Pin-Package
DS2401 DS2411	ROM only	64	1.5V operation with DS2411	6-TSOC, SOT23, T092, CSP
DS2431	EEPROM	1k	Write protection, OTP modes	6-TSOC, T092, CSP
DS2432	EEPROM	1k	SHA-1 authentication	6-TSOC, CSP
DS2433	EEPROM	4k	—	8-SO, PR35, Flip Chip
DS250x	EPROM	1k, 16k, 64k	Write protection	6-TSOC, T092, CSP
DS2405	ROM only	64	Single GPIO	6-TSOC, T092
DS2406	EPROM	1k	Dual GPIOs	6-TSOC, T092
DS2408	ROM only	64	Eight GPIOs	16-SO

See Page 5 for Integrated 1-Wire Line-Driver Solutions



Lowest Cost 1kb Serial EEPROM with World's Most Efficient 1-Wire Interface

The DS2431 is a 1kb EEPROM that is both communicated with and powered over the MAXIM/DALLAS 1-Wire interface. The 1-Wire interface is uniquely suited for applications where electrical contacts are limited or minimal wiring is required. The DS2431 provides programmable features that include write protection and OTP EPROM modes that can be individually applied to each of four 32-Byte pages. In OTP EPROM mode, bits in a page can be written from logic 1 to 0 but not written back to logic 1, making the part optimally suited for applications that track consumption of nonreplenishable consumables. Each DS2431 comes with a factory-lasered, unique 64-bit ROM ID which serves as a unique serial number or device address in the case of multiple 1-Wire devices on a common 1-Wire line. Host implementation of the 1-Wire interface is easily accomplished using a spare processor port pin, or one of the integrated line drivers described on page 5 of this design guide.



Features

- Operating Power Derived Entirely from the 1-Wire Line
- Designed for Hot/Live System Insertion
- Exceptional ESD Performance: +15kV IEC 1000-4-2 (typ)
- Wide Operating Ranges: +2.8V to +5.25V, -40°C to +85°C
- Available in TSOC, TO92, and CSP

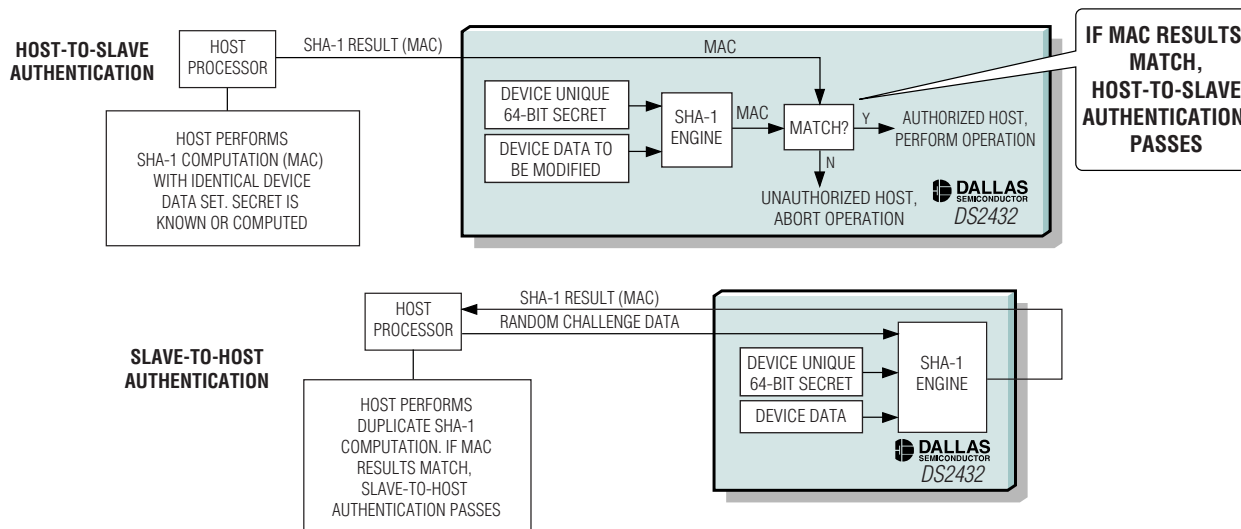
Ideal Applications

- Medical- and Industrial-Sensor Calibration
- Printer-Cartridge ID
- Accessory ID
- IEEE 1451.4 Sensors

For More Information or Samples of the DS2431, Go to:
www.maxim-ic.com/1WireDG

World-Class Secure Authentication Products Protect System Quality, Safety, and R&D Investment

Ensuring OEM quality, consumer safety, and a satisfying end-user experience are all critical for a successful product—factors that also must be addressed in today’s fiercely competitive marketplace. License management of hardware and software IP, and secure barriers to protect against unauthorized copying of products are also critical to protect the business required and expected from development investments. Dallas Semiconductor’s products and services meet these needs. Our SHA-1 (secure hash algorithm) 1-Wire EEPROM devices provide world-class mutual authentication, along with memory at price points that support use in high-volume, consumer-product applications.



SHA-1 Attributes

- **Nonreversible**—Computationally Infeasible to Determine the Input Corresponding to a SHA-1 Output
- **Collision-Resistant**—Impractical to Find More than One Input that Produces a Given SHA-1 Output
- **High Avalanche Effect**—Any Change in Input Produces Significant Change in MAC Result
- **Thoroughly Scrutinized and Certified**—Meets US FIPS 180-1 and 180-2 and International ISO/IEC 10118-3 Standards

Typical Applications

- Cell Phone Accessories
- Medical Sensors
- Battery Packs
- Printer Cartridges
- Reference-Design Licensing
- IP Protection
- Feature Control of Configurable Products

1-Wire SHA-1 Authentication Products

Part	Memory Type	Memory Size (kb)	Additional Features	Pin-Package
DS2432	EEPROM	1	24-bit challenge, 64-bit secret	6-TSOC, CSP
DS1963S	Battery-backed SRAM	4	Stores up to eight separate secrets	iButton®
DS28E01-100*	EEPROM	1	40-bit challenge, up to 320-bit secret	6-TSOC, CSP

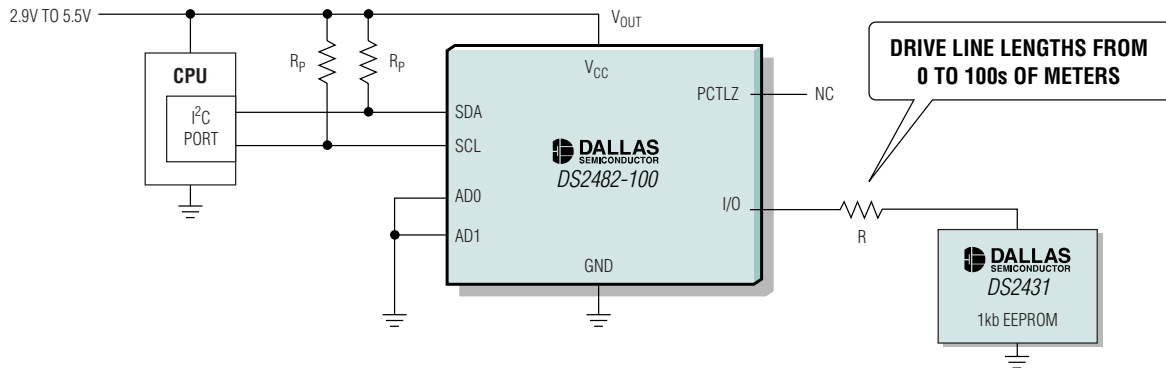
*Future product—contact factory for availability.

iButton is a registered trademark of Dallas Semiconductor Corp.



1-Wire Line Driving Optimized with Integrated Solutions

The hardware implementation of a 1-Wire bus master can be accomplished from something as basic as a spare microcontroller port pin and a pull-up resistor. Software bit-bangs the port pin to implement the 1-Wire protocol and read/write to slave devices. Another approach uses one of several Dallas Semiconductor 1-Wire line drivers that perform protocol conversion from a variety of serial or memory-mapped interfaces and provide high-level 1-Wire command capability. These devices can be used to greatly simplify the hardware/software development task necessary with discrete solutions. They also provide optimized 1-Wire waveform generation.



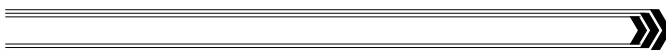
- Regular and Overdrive 1-Wire Communication Speeds
- I²C, RS-232, USB 1.1, Memory-Mapped Host Interfaces
- High-Level 1-Wire Command Sequences
- Edge Control of 1-Wire Waveforms, Extending Communication Distance to Hundreds of Meters (Regular Speed only)
- Low-Impedance, Strong Pullup for Slaves with Momentary High Source-Current Modes
- Resistive or Active 1-Wire Pullup
- 1-Wire, Slave-Presence Pulse, Falling-Edge Masking (DS2482)
- Wide Operating Ranges: +2.9V to +5.25V, -40°C to +85°C

Dallas Semiconductor 1-Wire Line Drivers

Base Part	Features
DS2480B	UART/RS-232-to-1-Wire protocol converter, provides a single 1-Wire bus master I/O port
DS2482-100	I ² C-to-1-Wire protocol converter, provides a single 1-Wire bus master I/O port
DS2482-800	I ² C-to-1-Wire protocol converter, provides eight 1-Wire bus master I/O ports
DS2490	USB-to-1-Wire protocol converter, 12Mbps USB1.1, provides a single 1-Wire bus master I/O port
DS1481	Parallel interface to 1-Wire line driver, single-bit operation
DS1482	Single-bit operation, +3.3V host to +5V 1-Wire level shifting, 1-Wire load sensing

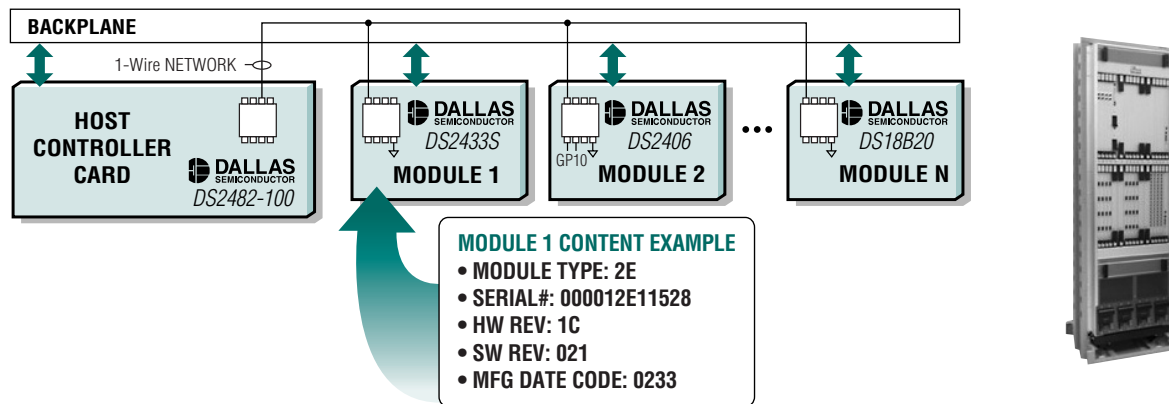
For More Information on 1-Wire Line Drivers, Go to:

www.maxim-ic.com/1WireDG



1-Wire Products Meet Rack-System Configuration and Monitoring Requirements

The controller in a module-based rack or chassis system often needs to identify what cards are installed and track hot-swapped units. 1-Wire memory and I/O products solve this problem by providing a unique identity for every module in the system and, additionally, enabling all devices to be interrogated over a common 1-Wire connection. Some devices also contain memory to store module configuration, manufacturing data, or revision history. Other versions have temperature sensors or programmable I/O pins that can be used to drive LEDs to indicate physical location and aid in finding a specific module.



Common 1-Wire Device Features

- Minimizes Backplane Connector Complexity
- Derives Operating Power Entirely from the 1-Wire Line
- Designed for Hot/Live System Insertion
- Wide Operating Ranges: +2.8V to +5.25V, -40°C to +85°C
- Each Part Uniquely Identified by a Factory-Lasered 64-bit ROM ID

Common Applications

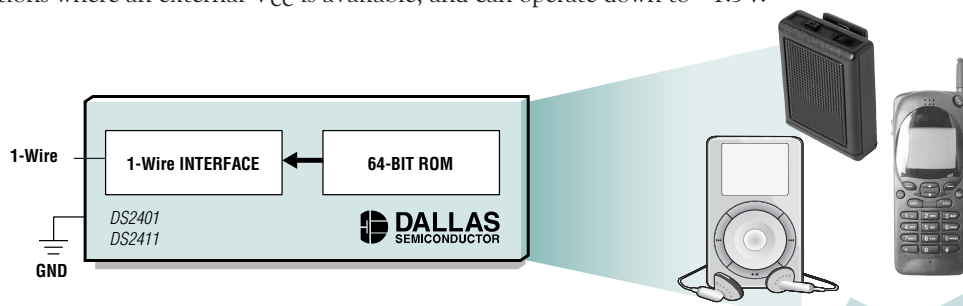
- Identification of Plug-In Cards/Modules
- Monitoring of
 - Wireless Base Stations
 - Central-Office Switches
 - Rack-Based Servers
 - Network Routers

Part	Memory Type	Memory Size (Bits)	Additional Features
DS2431	EEPROM	1k	—
DS2433	EEPROM	4k	—
DS250x	EPR0M	1k, 16k, 64k	—
DS2406	EPR0M	1k	Two GPIO pins
DS2408	ROM only	64	Eight GPIO pins
DS18B20	ROM only	64	Temp sensor, ±0.5°C accuracy
DS28E04-100*	EEPROM	4k	Seven external-address inputs, two GPIO pins
DS2480B	n/a	n/a	RS-232-to-1-Wire line driver
DS2482-x00	n/a	n/a	I ² C-to-1-Wire line driver

*Future product—contact factory for availability.

World's Smallest, Globally Unique, Electronic Serial Number

Use the DS2401 or DS2411 64-bit ROM to bind unique electronic identification to any device, PCB, or system. Each device is factory lasered with a unique, unalterable 64-bit serial number. Power and data are transferred over the single-contact 1-Wire interface. The 1-Wire protocol is easy to implement and can be easily accomplished with a spare processor port pin. The protocol can also support multiple 1-Wire devices on a common 1-Wire network. The DS2411 is suited for applications where an external V_{CC} is available, and can operate down to +1.5V.

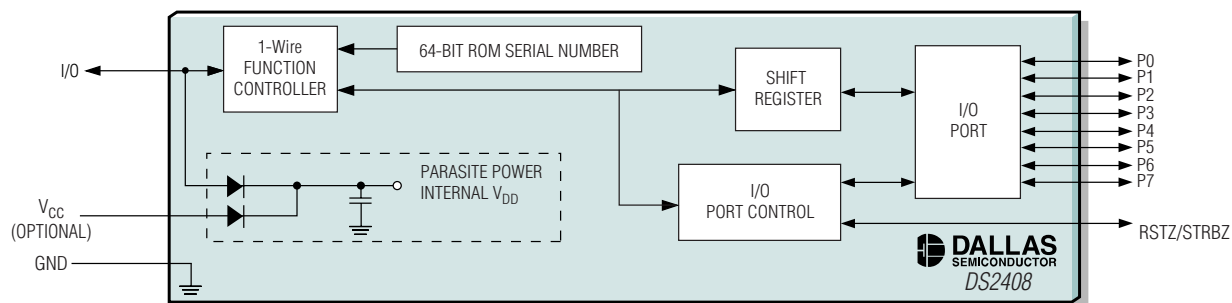


- **Exceptional ESD Performance: $\geq 8\text{kV}$ Human Body Model**
- **Wide Operating Ranges: +1.5V to +6.0V, -40°C to $+85^{\circ}\text{C}$**
- **5 μA (max) Idle Current**
- **Available in TO92, 6-Pin TSOC, SOT23, and CSP**



Eight GPIO Channels, Powered and Operated from a Single Port Pin

Greatly simplify the design of remote system control and monitoring functions with the eight channels of port expansion provided by the DS2408. Bidirectional data flow enables both open and closed-loop control. Embedded ROM-ID describes a physical location or identifies the controlled equipment. A data-valid strobe output is also provided to latch PIO logic states into or out of external circuitry, such as data converters or a microcontroller data bus. GPIO activity is also captured in an activity latch to support momentary contact applications such as keypad or pushbutton input.



- **100 Ω (max) On Resistance of PIO Pull-Down Transistor; 10M Ω (typ) Off Resistance**
- **Activity Registers to Latch Asynchronous GPIO Events**
- **STRBZ Pin Can Latch Data Into/Out of Converters or Processors**
- **Operating Ranges: +2.8V to +5.25V, -40°C to $+85^{\circ}\text{C}$**