

# DS18B20

## Programmable Resolution 1-Wire Digital Thermometer

### DESCRIPTION

The DS18B20 digital thermometer provides 9-bit to 12-bit Celsius temperature measurements and has an alarm function with nonvolatile user-programmable upper and lower trigger points. The DS18B20 communicates over a 1-Wire bus that by definition requires only one data line (and ground) for communication with a central microprocessor. It has an operating temperature range of -55°C to +125°C and is accurate to ±0.5°C over the range of -10°C to +85°C. In addition, the DS18B20 can derive power directly from the data line ("parasite power"), eliminating the need for an external power supply.

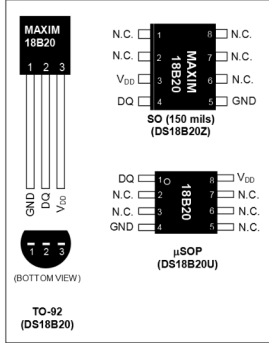
Each DS18B20 has a unique 64-bit serial code, which allows multiple DS18B20s to function on the same 1-Wire bus. Thus, it is simple to use one microprocessor to control many DS18B20s distributed over a large area. Applications that can benefit from this feature include HVAC environmental controls, temperature monitoring systems inside buildings, equipment or machinery, and process monitoring and control systems.

### FEATURES

- Unique 1-Wire® Interface Requires Only One Port Pin for Communication
- Each Device has a Unique 64-Bit Serial Code Stored in an On-Board ROM
- Multidrop Capability Simplifies Distributed Temperature-Sensing Applications
- Requires No External Components
- Can Be Powered from Data Line; Power Supply Range is 3.0V to 5.5V
- Measures Temperatures from -55°C to +125°C (-67°F to +257°F)
- ±0.5°C Accuracy from -10°C to +85°C
- Thermometer Resolution is User Selectable from 9 to 12 Bits
- Converts Temperature to 12-Bit Digital Word in 750ms (Max)

- User-Definable Nonvolatile (NV) Alarm Settings
- Alarm Search Command Identifies and Addresses Devices Whose Temperature is Outside Programmed Limits (Temperature Alarm Condition)
- Available in 8-Pin SO (150 mils), 8-Pin µSOP, and 3-Pin TO-92 Packages
- Software Compatible with the DS1822
- Applications Include Thermostatic Controls, Industrial Systems, Consumer Products, Thermometers, or Any Thermally Sensitive System

### PIN CONFIGURATIONS



1-Wire is a registered trademark of Maxim Integrated Products, Inc.

For pricing, delivery, and ordering information, please contact Maxim Direct at 1-888-629-4642, or visit Maxim's website at [www.maximintegrated.com](http://www.maximintegrated.com).

REV: 042208

DS18B20

### ORDERING INFORMATION

PART	TEMP RANGE	PIN-PACKAGE	TOP MARK
DS18B20	-55°C to +125°C	3 TO-92	18B20
DS18B20+	-55°C to +125°C	3 TO-92	18B20
DS18B20/T&R	-55°C to +125°C	3 TO-92 (2000 Piece)	18B20
DS18B20+T&R	-55°C to +125°C	3 TO-92 (2000 Piece)	18B20
DS18B20-SL/T&R	-55°C to +125°C	3 TO-92 (2000 Piece)*	18B20
DS18B20-SL+T&R	-55°C to +125°C	3 TO-92 (2000 Piece)*	18B20
DS18B20U	-55°C to +125°C	8 µSOP	18B20
DS18B20U+	-55°C to +125°C	8 µSOP	18B20
DS18B20U/T&R	-55°C to +125°C	8 µSOP (3000 Piece)	18B20
DS18B20U+T&R	-55°C to +125°C	8 µSOP (3000 Piece)	18B20
DS18B20Z	-55°C to +125°C	8 SO	DS18B20
DS18B20Z+	-55°C to +125°C	8 SO	DS18B20
DS18B20Z/T&R	-55°C to +125°C	8 SO (2500 Piece)	DS18B20
DS18B20Z+T&R	-55°C to +125°C	8 SO (2500 Piece)	DS18B20

\*Denotes a lead-free package. A "u" will appear on the top mark of lead-free packages.  
 T&R = Tape and reel.  
 \*TO-92 packages in tape and reel can be ordered with straight or formed leads. Choose "SL" for straight leads. Bulk TO-92 orders are straight leads only.

### PIN DESCRIPTION

PIN			NAME	FUNCTION
SO	µSOP	TO-92		
1, 2, 6, 7, 8	2, 3, 5, 6, 7	—	N.C.	No Connection
3	8	3	V <sub>DD</sub>	Optional V <sub>DD</sub> . V <sub>DD</sub> must be grounded for operation in parasite power mode.
4	1	2	DQ	Data Input/Output. Open-drain 1-Wire interface pin. Also provides power to the device when used in parasite power mode (see the <i>Powering the DS18B20</i> section.)
5	4	1	GND	Ground

### OVERVIEW

Figure 1 shows a block diagram of the DS18B20, and pin descriptions are given in the *Pin Description* table. The 64-bit ROM stores the device's unique serial code. The scratchpad memory contains the 2-byte temperature register that stores the digital output from the temperature sensor. In addition, the scratchpad provides access to the 1-byte upper and lower alarm trigger registers (T<sub>H</sub> and T<sub>L</sub>) and the 1-byte configuration register. The configuration register allows the user to set the resolution of the temperature-to-digital conversion to 9, 10, 11, or 12 bits. The T<sub>H</sub>, T<sub>L</sub>, and configuration registers are nonvolatile (EEPROM), so they will retain data when the device is powered down.

The DS18B20 uses Maxim's exclusive 1-Wire bus protocol that implements bus communication using one control signal. The control line requires a weak pullup resistor since all devices are linked to the bus via a 3-state or open-drain port (the DQ pin in the case of the DS18B20). In this bus system, the microprocessor (the master device) identifies and addresses devices on the bus using each device's unique 64-bit code. Because each device has a unique code, the number of devices that can be addressed on one