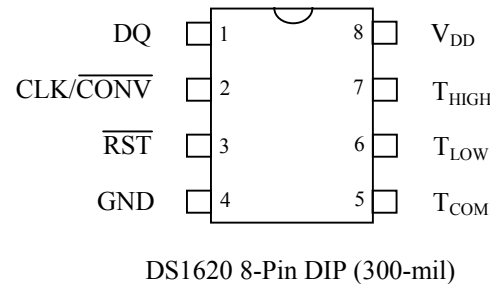
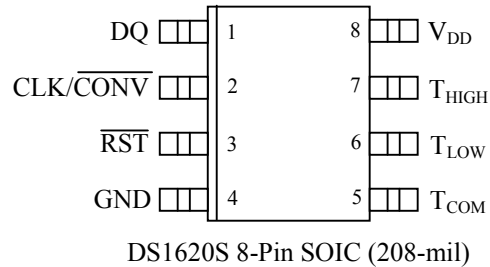


### FEATURES

- Requires no external components
- Supply voltage range covers from 2.7V to 5.5V
- Measures temperatures from -55°C to +125°C in 0.5°C increments; Fahrenheit equivalent is -67°F to +257°F in 0.9°F increments
- Temperature is read as a 9-bit value
- Converts temperature to digital word in 750 ms (max)
- Thermostatic settings are user-definable and nonvolatile
- Data is read from/written via a 3-wire serial interface (CLK, DQ,  $\overline{\text{RST}}$ )
- Applications include thermostatic controls, industrial systems, consumer products, thermometers, or any thermally sensitive system
- 8-pin DIP or SOIC (208-mil) packages

### PIN ASSIGNMENT



### PIN DESCRIPTION

- |                               |  |
|-------------------------------|--|
| DQ                            | - 3-Wire Input/Output                              |
| CLK/ $\overline{\text{CONV}}$ | - 3-Wire Clock Input and Stand-alone Convert Input |
| $\overline{\text{RST}}$       | - 3-Wire Reset Input                               |
| GND                           | - Ground   |
| T <sub>HIGH</sub>             | - High Temperature Trigger                         |
| T <sub>LOW</sub>              | - Low Temperature Trigger                          |
| T <sub>COM</sub>              | - High/Low Combination Trigger                     |
| V <sub>DD</sub>               | - Power Supply Voltage (3V - 5V)                   |

### DESCRIPTION

The DS1620 Digital Thermometer and Thermostat provides 9-bit temperature readings which indicate the temperature of the device. With three thermal alarm outputs, the DS1620 can also act as a thermostat. T<sub>HIGH</sub> is driven high if the DS1620's temperature is greater than or equal to a user-defined temperature TH. T<sub>LOW</sub> is driven high if the DS1620's temperature is less than or equal to a user-defined temperature TL. T<sub>COM</sub> is driven high when the temperature exceeds TH and stays high until the temperature falls below that of TL.

User-defined temperature settings are stored in nonvolatile memory, so parts can be programmed prior to insertion in a system, as well as used in standalone applications without a CPU. Temperature settings and temperature readings are all communicated to/from the DS1620 over a simple 3-wire interface.

## ORDERING INFORMATION

PART	PACKAGE MARKING	DESCRIPTION
DS1620	DS1620	8-Pin DIP (300 mil)
DS1620+	DS1620 (See Note)	Lead-Free 8-Pin DIP (300 mil)
DS1620S	DS1620	8-Pin SOIC (208 mil)
DS1620S+	DS1620 (See Note)	Lead-Free 8-Pin SOIC (208 mil)
DS1620S/T&R	DS1620	8-Pin SOIC (208 mil), 2000-Piece Tape-and-Reel
DS1620S+T&R	DS1620 (See Note)	Lead-Free 8-Pin SOIC (208 mil), 2000-Piece Tape-and-Reel

Note: A “+” symbol will also be marked on the package near the Pin 1 indicator

## DETAILED PIN DESCRIPTION Table 1

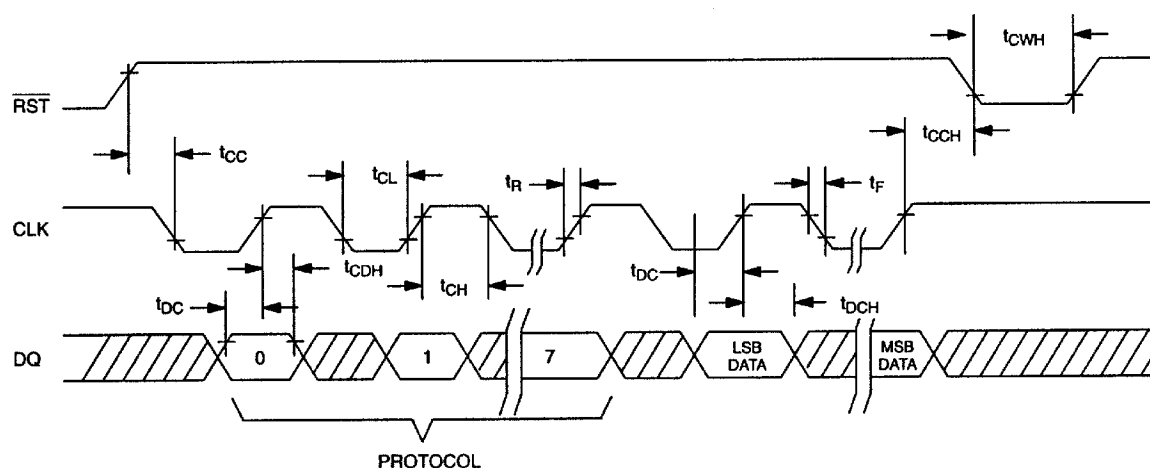
PIN	SYMBOL	DESCRIPTION
1	DQ	<b>Data Input/Output pin</b> for 3-wire communication port.
2	CLK/ $\overline{\text{CONV}}$	<b>Clock input pin</b> for 3-wire communication port. When the DS1620 is used in a stand-alone application with no 3-wire port, this pin can be used as a convert pin. Temperature conversion will begin on the falling edge of $\overline{\text{CONV}}$ .
3	$\overline{\text{RST}}$	<b>Reset input pin</b> for 3-wire communication port.
4	GND	<b>Ground pin.</b>
5	T <sub>COM</sub>	<b>High/Low Combination Trigger.</b> Goes high when temperature exceeds TH; will reset to low when temperature falls below TL.
6	T <sub>LOW</sub>	<b>Low Temperature Trigger.</b> Goes high when temperature falls below TL.
7	T <sub>HIGH</sub>	<b>High Temperature Trigger.</b> Goes high when temperature exceeds TH.
8	V <sub>DD</sub>	<b>Supply Voltage.</b> 2.7V – 5.5V input power pin.

## Table 2. DS1620 REGISTER SUMMARY

REGISTER NAME (USER ACCESS)	SIZE	MEMORY TYPE	REGISTER CONTENTS AND POWER-UP/POR STATE
Temperature (Read Only)	9 Bits	SRAM	Measured Temperature (Two's Complement) Power-Up/POR State: -60°C (1 1000 1000)
T <sub>H</sub> (Read/Write)	9 Bits	EEPROM	Upper Alarm Trip Point (Two's Complement) Power-Up/POR State: User-Defined. Initial State from Factory: +15°C (0 0001 1110)
T <sub>L</sub> (Read/Write)	9 Bits	EEPROM	Lower Alarm Trip Point (Two's Complement) Power-Up/POR State: User-Defined. Initial State from Factory: +10°C (0 0001 0100)

## OPERATION-MEASURING TEMPERATURE

A block diagram of the DS1620 is shown in Figure 1.

**WRITE DATA TRANSFER Figure 5**

NOTE:  $t_{\text{CL}}$ ,  $t_{\text{CH}}$ ,  $t_{\text{R}}$ , and  $t_{\text{F}}$  apply to both read and write data transfer.

**ABSOLUTE MAXIMUM RATINGS\***

Voltage on Any Pin Relative to Ground	-0.5V to +6.0V
Operating Temperature	-55°C to +125°C
Storage Temperature	-55°C to +125°C
Soldering Temperature	260°C for 10 seconds

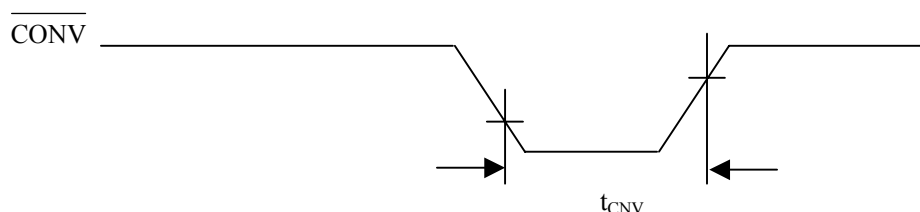
\* This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operation sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods of time may affect reliability.

**RECOMMENDED DC OPERATING CONDITIONS**

PARAMETER	SYMBOL	MIN	TYP	MAX	UNITS	NOTES
Supply	$V_{\text{DD}}$	2.7		5.5	V	1,2
Logic 1	$V_{\text{IH}}$	$0.7 \times V_{\text{DD}}$		$V_{\text{CC}} + 0.3$	V	1
Logic 0	$V_{\text{IL}}$	-0.3		$0.3 \times V_{\text{DD}}$	V	1

**DC ELECTRICAL CHARACTERISTICS** (-55°C to +125°C;  $V_{DD}=2.7V$  to 5.5V)

PARAMETER	SYMBOL	CONDITION	MIN	MAX	UNITS	NOTES
Thermometer Error	$T_{ERR}$	0°C to +70°C $3.0V \leq V_{DD} \leq 5.5V$		±0.5	°C	2
		0°C to +70°C $2.7V \leq V_{DD} < 3.0V$		±1.25		
		-55°C to +125°C		±2.0		
Thermometer Resolution				12	Bits	
Logic 0 Output	$V_{OL}$			0.4	V	4
Logic 1 Output	$V_{OH}$		2.4		V	5
Input Resistance	$R_I$	$\overline{RST}$ to GND	1		MΩ	
		DQ, CLK to $V_{DD}$	1		MΩ	
Active Supply Current	$I_{CC}$	0°C to +70°C		1	mA	6
Standby Supply Current	$I_{STBY}$	0°C to +70°C		1.5	μA	6
Input Current on Each Pin		$0.4 < V_{IO} < 0.9 \times V_{DD}$	-10	+10	μA	
Thermal Drift				±0.2	°C	7

**SINGLE CONVERT TIMING DIAGRAM (STAND-ALONE MODE)****AC ELECTRICAL CHARACTERISTICS** (-55°C to +125°C;  $V_{DD}=2.7V$  to 5.5V)

PARAMETERS	SYMBOL	MIN	TYP	MAX	UNITS	NOTES
Temperature Conversion Time	$T_{TC}$			750	ms	
Data to CLK Setup	$t_{DC}$	35			ns	8
CLK to Data Hold	$t_{CDH}$	40			ns	8
CLK to Data Delay	$t_{CDD}$			150	ns	8, 9, 10
CLK Low Time	$t_{CL}$	285			ns	8
CLK High Time	$t_{CH}$	285			ns	8
CLK Frequency	$f_{CLK}$	DC		1.75	MHz	8
CLK Rise and Fall	$t_R, t_F$			500	ns	
$\overline{RST}$ to CLK Setup	$t_{CC}$	100			ns	8
CLK to $\overline{RST}$ Hold	$t_{CCH}$	40			ns	8
$\overline{RST}$ Inactive Time	$t_{CWH}$	125			ns	8, 11
CLK High to I/O High-Z	$t_{CDZ}$			50	ns	8
$\overline{RST}$ Low to I/O High-Z	$t_{RDZ}$			50	ns	8
Convert Pulse Width	$t_{CNV}$	250 ns		500 ms		12

**AC ELECTRICAL CHARACTERISTICS** (-55°C to +125°C;  $V_{DD}=2.7V$  to 5.5V)

PARAMETER	SYMBOL	MIN	TYP	MAX	UNITS	NOTES
Input Capacitance	$C_I$		5		pF	
I/O Capacitance	$C_{I/O}$		10		pF	

**EEPROM AC ELECTRICAL CHARACTERISTICS**(-55°C to +125°C;  $V_{DD}=2.7V$  to 5.5V)

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
EEPROM Write Cycle Time			4	10	Ms
EEPROM Writes	-55°C to +55°C	50k			Writes
EEPROM Data Retention	-55°C to +55°C	10			Years