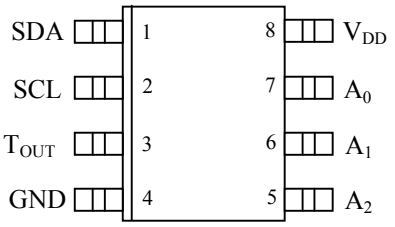
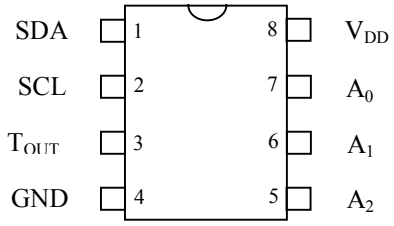
DS1621
Digital Thermometer and Thermostat

FEATURES
- Temperature measurements require no external components
- 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 (2-byte transfer)
- Wide power supply range (2.7V to 5.5V)
- Converts temperature to digital word in less than 1 second
- Thermostatic settings are user definable and nonvolatile
- Data is read from/written via a 2-wire serial interface (open drain I/O lines)
- Applications include thermostatic controls, industrial systems, consumer products, thermometers, or any thermal sensitive system
- 8-pin DIP or SO package (150mil and 208mil)

PIN ASSIGNMENT



DS1621S 8-PIN SO (150mil)
DS1621V 8-PIN SO (208mil)



DS1621 8-PIN DIP (300mil)

PIN DESCRIPTION

SDA	- 2-Wire Serial Data Input/Output
SCL	- 2-Wire Serial Clock
GND	- Ground
T_{OUT}	- Thermostat Output Signal
A0	- Chip Address Input
A1	- Chip Address Input
A2	- Chip Address Input
V_{DD}	- Power Supply Voltage

DESCRIPTION
The DS1621 Digital Thermometer and Thermostat provides 9-bit temperature readings, which indicate the temperature of the device. The thermal alarm output, T_{OUT}, is active when the temperature of the device exceeds a user-defined temperature TH. The output remains active until the temperature drops below user defined temperature TL, allowing for any hysteresis necessary.

User-defined temperature settings are stored in nonvolatile memory so parts may be programmed prior to insertion in a system. Temperature settings and temperature readings are all communicated to/from the DS1621 over a simple 2-wire serial interface.

ORDERING INFORMATION

ORDERING NUMBER	PACKAGE MARKING	DESCRIPTION
DS1621	DS1621	DS1621 in 300 mil DIP
DS1621+	DS1621 (See Note)	DS1621 in Lead-Free 300 mil DIP
DS1621S	DS1621	DS1621 in 150 mil SOIC
DS1621S+	DS1621 (See Note)	DS1621 in Lead-Free 150 mil SOIC
DS1621S/T&R	DS1621	DS1621 in 150 mil SO, 2500 Piece Tape-and-Reel
DS1621S+T&R	DS1621 (See Note)	DS1621 in Lead-Free 150 mil SO, 2500 Piece Tape-and-Reel
DS1621V	DS1621V	DS1621 in 208 mil SOIC
DS1621V+	DS1621V (See Note)	DS1621 in Lead-Free 208 mil SOIC
DS1621V/T&R	DS1621V	DS1621 in 208 mil SO, 2500 Piece Tape-and-Reel
DS1621V+T&R	DS1621V (See Note)	DS1621 in Lead-Free 208 mil SO, 2500 Piece Tape-and-Reel

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

Table 1. DETAILED PIN DESCRIPTION

PIN	SYMBOL	DESCRIPTION
1	SDA	Data input/output pin for 2-wire serial communication port.
2	SCL	Clock input/output pin for 2-wire serial communication port.
3	T_{OUT}	Thermostat output. Active when temperature exceeds TH; will reset when temperature falls below TL.
4	GND	Ground pin.
5	A2	Address input pin.
6	A1	Address input pin.
7	A0	Address input pin.
8	V_{DD}	Supply voltage input power pin. (2.7V to 5.5V)

OPERATION

Measuring Temperature

A block diagram of the DS1621 is shown in Figure 1.

The DS1621 measures temperature using a bandgap-based temperature sensor. A delta-sigma analog-to-digital converter (ADC) converts the measured temperature to a digital value that is calibrated in °C; for °F applications, a lookup table or conversion routine must be used.

The temperature reading is provided in a 9-bit, two's complement reading by issuing the READ TEMPERATURE command. Table 2 describes the exact relationship of output data to measured temperature. The data is transmitted through the 2-wire serial interface, MSB first. The DS1621 can measure temperature over the range of -55°C to +125°C in 0.5°C increments.

ABSOLUTE MAXIMUM RATINGS*

Voltage on Any Pin Relative to Ground	-0.5V to +6.0V
Operating Temperature Range	-55°C to +125°C
Storage Temperature Range	-55°C to +125°C
Soldering Temperature	See IPC/JEDEC J-STD-020A Specification

** 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 Voltage	V_{DD}	2.7		5.5	V	1

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

PARAMETER	SYMBOL	CONDITION	MIN	TYP	MAX	UNITS	NOTES
Thermometer Error	T_{ERR}	0°C to 70°C 3.0V≤V_{DD}≤5.5V			±½	°C	
		0°C to 70°C 2.7V≤V_{DD}≤3.0V			±1	°C	
		-55°C to +0°C and 70°C to 125°C			±2	°C	
Thermometer Resolution					12	bits	
Low Level Input Voltage	V_{IL}		0.5		0.3 V_{DD}	V	
High Level Input Voltage	V_{IH}		0.7 V_{DD}		V_{DD}+0.3	V	
Pulse width of spikes which must be suppressed by the input filter	t_{SP}	Fast Mode	0		50	ns	
Low Level Output Voltage	V_{OL1}	3 mA Sink Current	0		0.4	V	
	V_{OL2}	6 mA Sink Current	0		0.6	V	
Input Current each I/O Pin		0.4<$V_{I/O}$<0.9V_{DD}	-10		10	µA	2
I/O Capacitance	$C_{I/O}$				10	pF	

Active Supply Current	I_{CC}	Temperature Conversion -55°C to +85°C Temperature Conversion +85°C to +125°C E^2 Write Communication Only			1000 1250 400 110	µA	3, 4
Standby Supply Current	I_{STBY}				1	µA	3, 4
Thermostat Output (T_{OUT}) Output Voltage	V_{OH}	1 mA Source	2.4			V	
	V_{OL}	4 mA Sink			0.4	V	

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

PARAMETER	SYMBOL	CONDITION	MIN	TYP	MAX	UNITS	NOTES
Temperature Conversion Time	T_{TC}				750	ms	
NV Write Cycle Time	t_{WR}	0°C to 70°C		4	10	ms	10
SCL Clock Frequency	f_{SCL}	Fast Mode Standard Mode	0 0		400 100	KHz	
Bus Free Time Between a STOP and START Condition	t_{BUF}	Fast Mode Standard Mode	1.3 4.7			µs	
Hold Time (Repeated) START Condition	$t_{HD:STA}$	Fast Mode Standard Mode	0.6 4.0			µs	5
Low Period of SCL Clock	T_{LOW}	Fast Mode Standard Mode	1.3 4.7			µs	
High Period of SCL Clock	T_{HIGH}	Fast Mode Standard Mode	0.6 4.0			µs	
Setup Time for a Repeated START Condition	$t_{SU:STA}$	Fast Mode Standard Mode	0.6 4.7			µs	
Data Hold Time	$t_{HD:DAT}$	Fast Mode Standard Mode	0 0		0.9	µs	6, 7
Data Setup Time	$t_{SU:DAT}$	Fast Mode Standard Mode	100 250			ns	8
Rise Time of Both SDA and SCL Signals	t_R	Fast Mode Standard Mode	$20+0.1C_B$		300 1000	ns	9
Fall Time of both SDA and SCL Signals	t_F	Fast Mode Standard Mode	$20+0.1C_B$		300 300	ns	9
Setup time for STOP Condition	$t_{SU:STO}$	Fast Mode Standard Mode	0.6 4.0			µs	
Capacitative Load for each Bus Line	C_b				400	pF	

All values referred to V_{IH}=0.9 V_{DD} and V_{IL}=0.1 V_{DD}.

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	