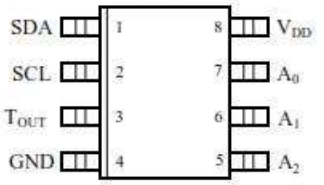
LE DS1621 : documentation

Présentation du circuit DS1621 :

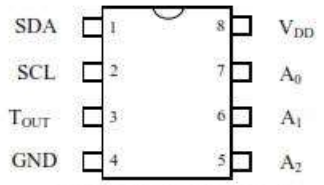
FEATURES

- 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 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)
See Mech Drawings Section



DS1621 8-PIN DIP (300mil)
See Mech Drawings Section

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.

DS1621

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)

Table 2. TEMPERATURE/DATA RELATIONSHIPS

TEMPERATURE	DIGITAL OUTPUT (Binary)	DIGITAL OUTPUT (Hex)
+125°C	01111101 00000000	7B00h
+25°C	00011001 00000000	1900h
+½°C	00000001 10000000	0080h
+0°C	00000000 00000000	0000h
-½°C	11111111 10000000	FF80h
-25°C	11100111 00000000	E700h
-55°C	11001001 00000000	C900h

Since data is transmitted over the 2-wire bus MSB first, temperature data may be written to/read from the DS1621 as either a single byte (with temperature resolution of 1°C) or as two bytes. The second byte would contain the value of the least significant (0.5°C) bit of the temperature reading as shown in Table 1. Note that the remaining 7 bits of this byte are set to all "0"s.

Temperature is represented in the DS1621 in terms of a ½°C LSB, yielding the following 9-bit format:

MSB								LSB							
1	1	1	0	0	1	1	1	0	0	0	0	0	0	0	0

T = -25°C

OPERATION AND CONTROL

The DS1621 must have temperature settings resident in the TH and TL registers for thermostatic operation. A configuration/status register also determines the method of operation that the DS1621 will use in a particular application, as well as indicating the status of the temperature conversion operation.

The configuration register is defined as follows:

DONE	THF	TLF	NVB	1	0	POL	1SHOT

where

DONE = Conversion Done bit. "1" = Conversion complete, "0" = Conversion in progress.

THF = Temperature High Flag. This bit will be set to "1" when the temperature is greater than or equal to the value of TH. It will remain "1" until reset by writing "0" into this location or removing power from the device. This feature provides a method of determining if the DS1621 has ever been subjected to temperatures above TH while power has been applied.

TLF = Temperature Low Flag. This bit will be set to "1" when the temperature is less than or equal to the value of TL. It will remain "1" until reset by writing "0" into this location or removing power from the device. This feature provides a method of determining if the DS1621 has ever been subjected to temperatures below TL while power has been applied.

NVB = Nonvolatile Memory Busy flag. "1" = Write to an E^2 memory cell in progress, "0" = nonvolatile memory is not busy. A copy to E^2 may take up to 10 ms.

POL = Output Polarity Bit. "1" = active high, "0" = active low. This bit is nonvolatile.

1SHOT = One Shot Mode. If 1SHOT is "1", the DS1621 will perform one temperature conversion upon receipt of the Start Convert T protocol. If 1SHOT is "0", the DS1621 will continuously perform temperature conversions. This bit is nonvolatile.

For typical thermostat operation the DS1621 will operate in continuous mode. However, for applications where only one reading is needed at certain times or to conserve power, the one-shot mode may be used. Note that the thermostat output (T_{OUT}) will remain in the state it was in after the last valid temperature conversion cycle when operating in one-shot mode.

SLAVE ADDRESS

A control byte is the first byte received following the START condition from the master device. The control byte consists of a 4-bit control code; for the DS1621, this is set as 1001 binary for read and write operations. The next 3 bits of the control byte are the device select bits (A2, A1, A0). They are used by the master device to select which of eight devices are to be accessed. These bits are in effect the 3 least significant bits of the slave address. The last bit of the control byte ($R/\overline{W}$) defines the operation to be performed. When set to a "1" a read operation is selected, when set to a "0" a write operation is selected. Following the START condition the DS1621 monitors the SDA bus checking the device type identifier being transmitted. Upon receiving the 1001 code and appropriate device select bits, the slave device outputs an acknowledge signal on the SDA line.

Table 3. DS1621 COMMAND SET

INSTRUCTION	DESCRIPTION	PROTOCOL	2-WIRE BUS DATA AFTER ISSUING PROTOCOL	NOTES
TEMPERATURE CONVERSION COMMANDS				
Read Temperature	Read last converted temperature value from temperature register.	AAh	<read 2 bytes data>	
Read Counter	Reads value of count remaining from counter.	A8h	<read data>	
Read Slope	Reads value of the slope accumulator.	A9h	<read data>	
Start Convert T	Initiates temperature conversion.	EEh	idle	1
Stop Convert T	Halts temperature conversion.	22h	idle	1
THERMOSTAT COMMANDS				
Access TH	Reads or writes high temperature limit value into TH register.	A1h	<write data>	2
Access TL	Reads or writes low temperature limit value into TL register.	A2h	<write data>	2
Access Config	Reads or writes configuration data to configuration register.	ACh	<write data>	2

Procédure pour la programmation du DS1621 : A2A1A0=000

Initialisation : init_DS1621()

1 Valider la liaison I2C.
2 Faire une condition de start et envoyer l'adresse I2C du DS1621.
3 Écrire la donnée I2C: 0xAC : on écrit dans le registre de configuration
4 Écrire la donnée I2C: 0×00 : conversion de température en continue
5 Condition d'arrêt (stop)
6 Attendre 20ms
7 Faire une condition de start et envoyer l'adresse I2C du DS1621
8 Écrire la donnée I2C 0xEE : lancement de la conversion en continue de la température
9 Condition d'arrêt (stop)

Lecture de la température : lect_DS1621()

1 Faire une condition de start et envoyer l'adresse I2C du DS1621
2 Écrire la donnée I2C : 0xAA : <Read 2 bytes Data>
3 On demande deux octets : Wire.requestFrom(0x48,2);
4 Lecture des deux octets représentant la température :
Il faut utiliser Wire.available() et Wire.read().
5 Condition d'arrêt (stop)
6 Afficher dans un terminal la température.