lamaPLC: DS18B20 1-Wire Digital Thermometer

The DS18B20 digital thermometer offers 9-bit to 12-bit Celsius temperature readings and features an alarm function with nonvolatile, user-programmable upper and lower trigger points. It communicates via a 1-Wire bus that requires only one data line (and ground) to connect with a central microprocessor. Additionally, the DS18B20 can draw power directly from the data line, known as "parasite power", eliminating the need for an external power supply.

Each DS18B20 has a unique 64-bit serial code, enabling multiple units to operate on the same 1-Wire bus. This makes it easy to control multiple DS18B20s from a single microcontroller over a large area.

This feature benefits applications such as 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.
- Multidrop capability simplifies distributed temperature sensing applications.
- It requires no external components and can be powered from a data line.
- The power supply range is **3.0V to 5.5V** DC.
- Zero standby power is required.
- It measures temperatures from **-55°C to +125°C**. The Fahrenheit equivalent is **-67°F to +257°F**.
- It offers ±0.5°C accuracy from -10°C to +85°C.
- Thermometer resolution is programmable from 9 to 12 bits.
- Converts 12-bit temperature to a digital word in 750 ms (max.).
- User-definable, nonvolatile temperature alarm settings are available.
- The alarm search command identifies and addresses devices whose temperature is outside the programmed limits (temperature alarm condition).
- Applications include thermostatic controls, industrial systems, consumer products, thermometers, or any thermally sensitive system.

The BME/BMP sensors can be integrated with the Tasmota system.
For more details, see here: https://tasmota.github.io/docs/DS18x20/

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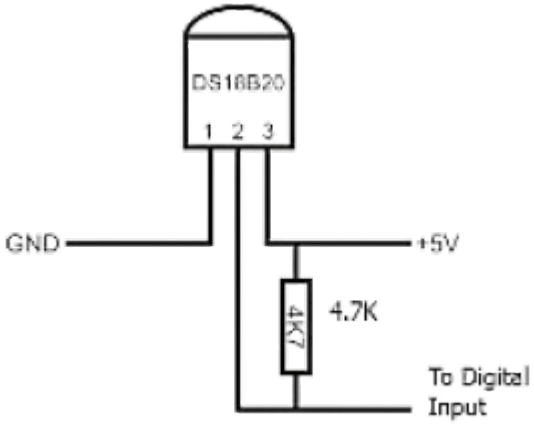
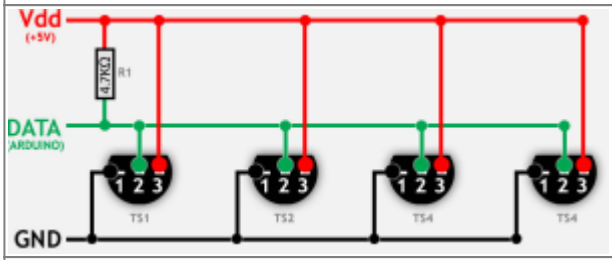
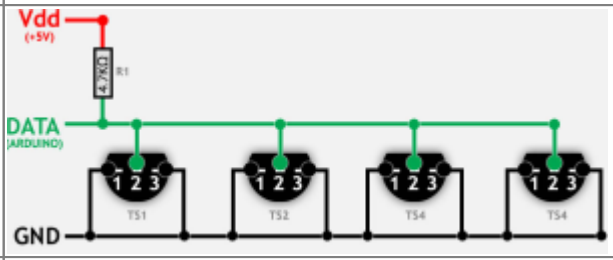
Wiring

Red wire: Power supply (3.0V - 5.5V DC) **Black wire:** GND **Yellow wire:** Signal (1-wire bus)		

Parasitic/normal mode DS18B20 / 1-wire bus

Normal mode	Parasitic mode
	
With an external supply, three wires are needed: the bus wire, ground, and power. The **4.7k pull-up resistor** remains necessary on the bus wire. Since the bus is available for data transfer, the microcontroller can continually check the device's status during conversion. This allows a conversion to complete as soon as the device reports it is done, without waiting for the conversion time (which depends on device function and resolution) in *“parasite”* power mode.	When operating in parasite power mode, it requires only two wires: one data wire and one ground wire. The power line must be connected to ground in this mode, as specified in the datasheet. A 4.7k pull-up resistor should be connected to the 1-wire bus at the controller. When the line is in a *“high”* state, the device pulls current to charge an internal component capacitor.

Addressing a 1-Wire device

Each 1-Wire device has a unique 64-bit 'ROM' address, which includes an 8-bit family code, a 48-bit serial number, and an 8-bit CRC. The CRC helps verify data integrity.

For example, the sample code below checks if the device being addressed is a DS18S20 temperature sensor by looking for its family code, 0x10. To use the sample code with the newer DS18B20 sensor, you would look for a family code of 0x28. For the DS1822, you would check for 0x22.

Arduino

The DS18B20 is a popular 1-Wire digital temperature sensor known for its simplicity and the ability to

connect multiple sensors to a single Arduino pin.

Wiring & Pull-up Resistor

The most critical component of the setup is the 4.7 kΩ pull-up resistor. Without it, the 1-Wire bus cannot return to a “high” state, and you will not get any readings.

- **VCC:** 3.3V or 5V
- **GND:** Ground
- **Data (DQ):** Any digital pin (e.g., Pin 2)
- **Resistor:** Place the 4.7kΩ resistor between VCC and Data.

Required Libraries

To run the code below, install these two libraries via the Arduino Library Manager (Sketch > Include Library > Manage Libraries):

- **OneWire** by Paul Stoffregen
- **DallasTemperature** by Miles Burton

Arduino Sketch

This script initializes the sensor and prints the temperature in both Celsius and Fahrenheit every second.

```
#include <OneWire.h>
#include <DallasTemperature.h>

// Data wire is plugged into port 2 on the Arduino
#define ONE_WIRE_BUS 2

// Setup a oneWire instance to communicate with any OneWire devices
OneWire oneWire(ONE_WIRE_BUS);

// Pass our oneWire reference to Dallas Temperature.
DallasTemperature sensors(&oneWire);

void setup(void) {
  Serial.begin(9600);
  Serial.println("DS18B20 Single Sensor Read");

  // Start up the library
  sensors.begin();
}

void loop(void) {
  // Send the command to get temperatures
  Serial.print("Requesting temperatures...");
  sensors.requestTemperatures();
  Serial.println("DONE");
```

```
  // Use index 0 to refer to the first (and only) sensor on the wire
  float tempC = sensors.getTempCByIndex(0);

  // Check if reading was successful
  if(tempC != DEVICE_DISCONNECTED_C) {
    Serial.print("Temperature: ");
    Serial.print(tempC);
    Serial.print("°C | ");
    Serial.print(DallasTemperature::toFahrenheit(tempC));
    Serial.println("°F");
  } else {
    Serial.println("Error: Could not read temperature data");
  }

  delay(1000);
}
```

1-wire topics on lamaPLC

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