

USER MANUAL
FOR THE LM-34 A PRECISION FAHRENHEIT TEMPERATURE SENSORS
FUNCTION MODULE

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1. INTRODUCTION

Temperature is the most-measured process variable in industrial automation. Most commonly, a temperature sensor is used to convert temperature value to an electrical value. Temperature Sensors are the key to read temperatures correctly and to control temperature in industrial applications.

A large distinction can be made between temperature sensor types. Sensors differ a lot in properties such as contact-way, temperature range, calibrating method and sensing element. The temperature sensors contain a sensing element enclosed in housings of plastic or metal. With the help of conditioning circuits, the sensor will reflect the change of environmental temperature.

In the temperature functional module we developed, we use the LM34 series of temperature sensors. The LM34 series are precision integrated-circuit temperature sensors, whose output voltage is linearly proportional to the Fahrenheit temperature. The LM34 thus has an advantage over linear temperature sensors calibrated in degrees Kelvin, as the user is not required to subtract a large constant voltage from its output to obtain convenient Fahrenheit scaling. The LM34 does not require any external calibration or trimming to provide typical accuracies of $\pm 1.2^{\circ}\text{F}$ at room temperature and $\pm 1.2^{\circ}\text{F}$ over a full -50 to $+300^{\circ}\text{F}$ temperature range. The LM34 is rated to operate over a -50° to $+300^{\circ}\text{F}$ temperature range.

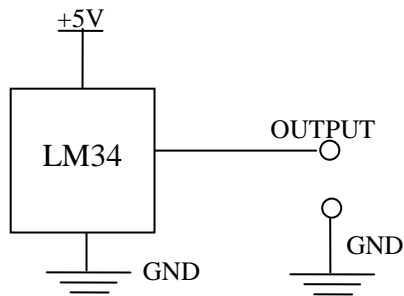


Figure 1 Circuit diagram for the LM34 temperature sensor functional module

It is easy to include the LM34 series in a temperature measuring application. The output voltage of LM34 is linearly proportional to the Fahrenheit temperature, it has a Linear +10.0 mV/°F scale factor which means that you will get $n \times 10.0$ mV output voltage if the environment temperature is $n^\circ\text{F}$.

The LM34 series is available packaged in hermetic TO-46 transistor packages, while the LM34C, LM34CA and LM34D are also available in the plastic TO-92 transistor package. The LM34D is also available in an 8-lead surface mount small outline package. In our functional module, LM34H in metal can package (TO-46) is used in the functional module, it is very important to know that the wiring of sensor should be based on the positions of the leading pins in different packages.

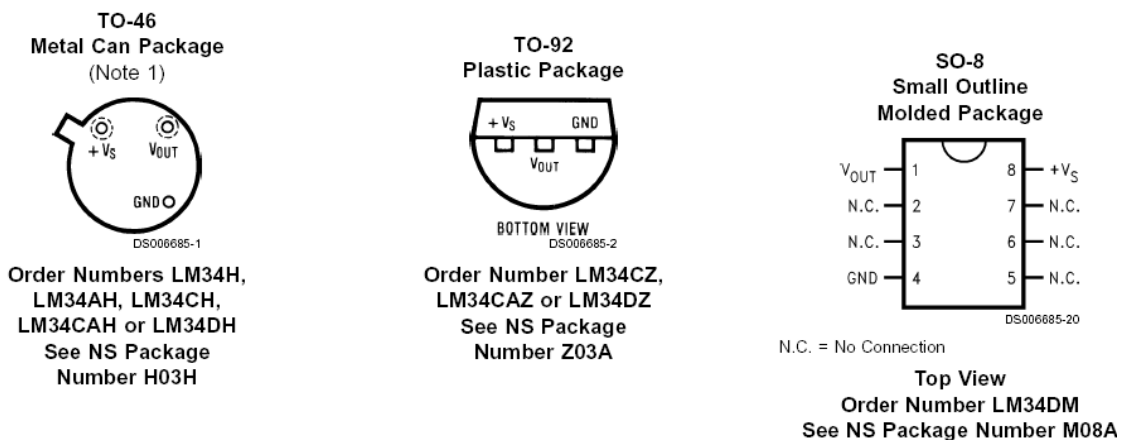


Figure 2 Package Diagram of LM34

2. DESCRIPTION OF TEMPERATURE SENSOR FUNCTIONAL MODULE

The temperature sensor functional module consists of two parts: the function module box and the probe head. The LM34 temperature sensor is mounted on the probe head. Be careful to make sure that the sensor is properly mounted on the probe head. (refer to Figure 4 Labeled picture of the probe head.)

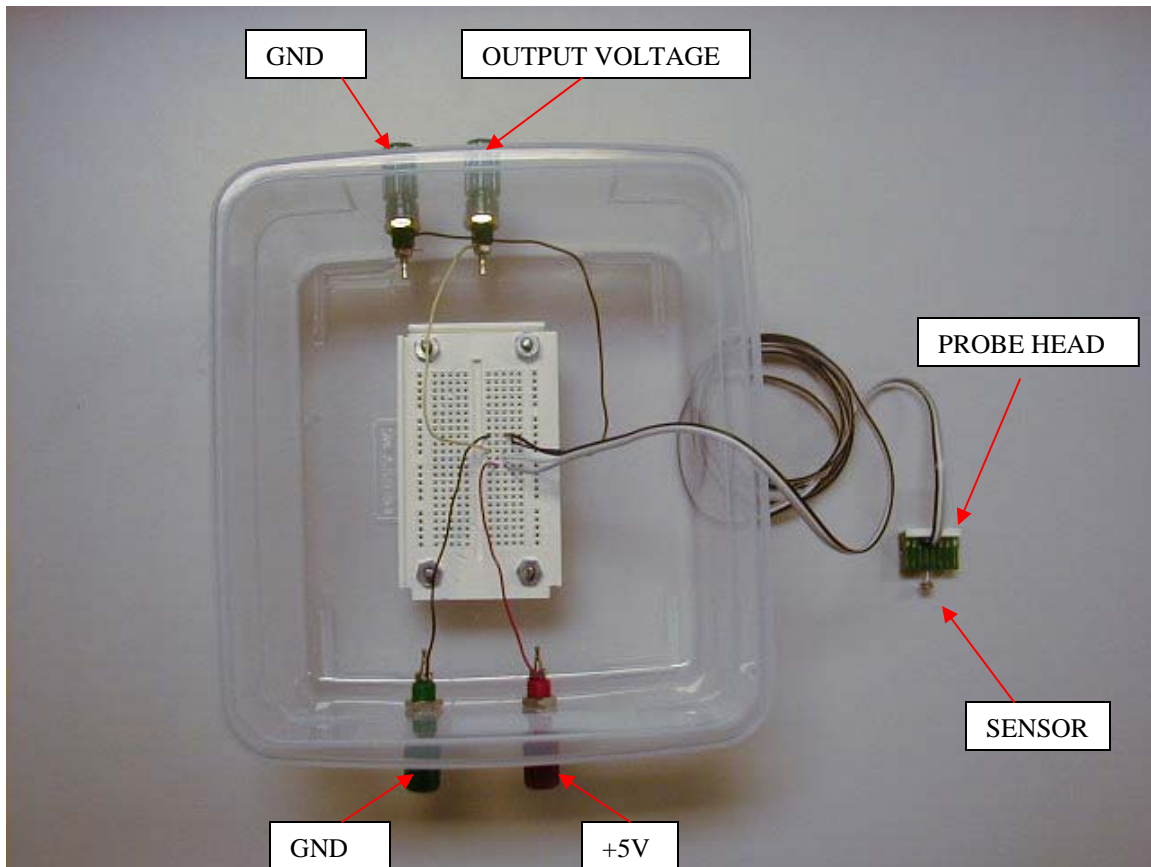


Figure 3 Labeled picture of the temperature sensor circuit functional module.

By replacing the LM34 with another precision integrated-circuit temperature sensor LM35, we can easily get an output voltage proportional to the centigrade temperature. The LM35 sensor has a linear $+10.0 \text{ mV}/^\circ\text{C}$ scale factor and a temperature range from

-55°C to +150°C. In fact LM34 and LM35 are among the same series of temperature sensors so that they can be easily exchanged in different applications. The wiring for LM 35 is the same as that of LM34. Please refer to the datasheets of LM34 and LM35 for more detailed packaging and features information.

3. WIRING INSTRUCTIONS

Wiring of the LM34 temperature functional module consists of wiring of functional module box and wiring of the sensor probe. The sensor is mounted on the probe head and the probe is connected to the module box. For LM34 in metal can package (TO-46), the small tab on the sensor indicates the position of “+Vs” leading pin (please refer to Figure 2 and datasheet of LM34).

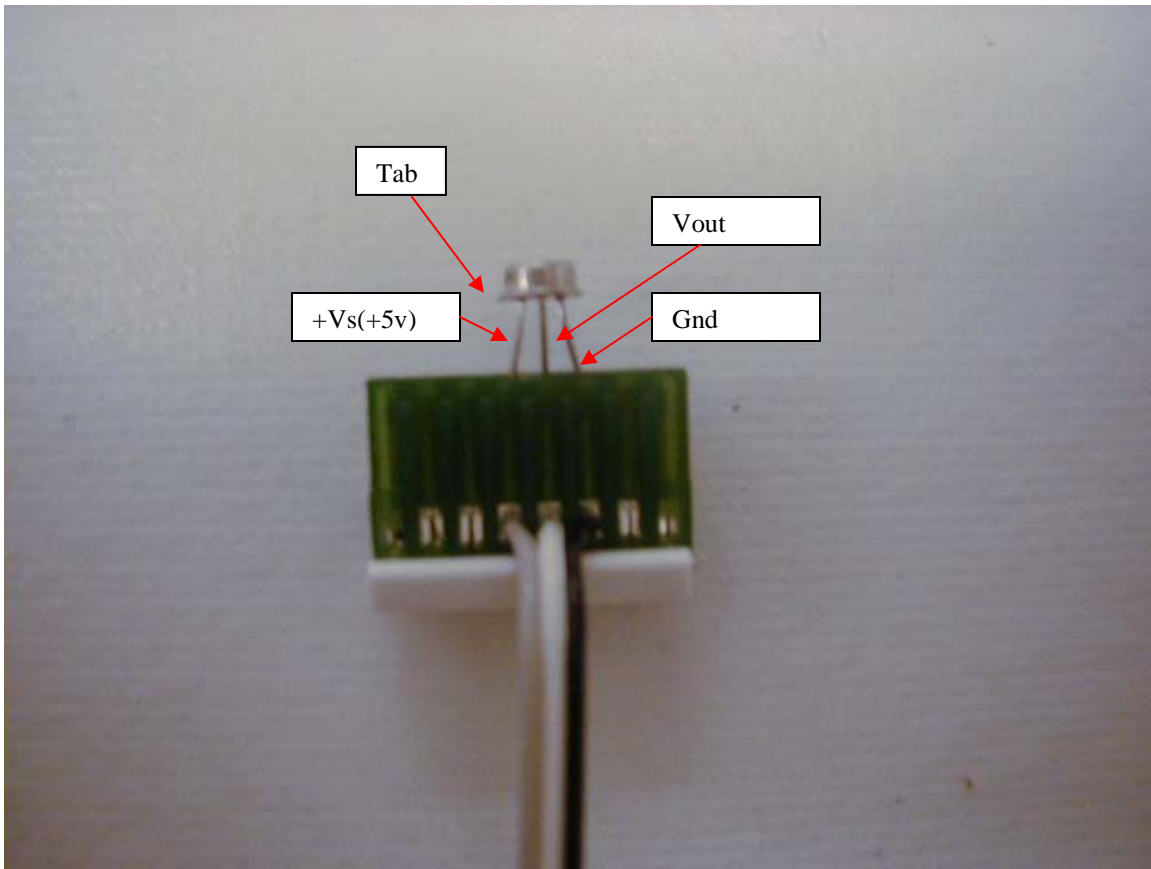


Figure 4 Labeled picture of the probe head.

Table 1 Wiring directions for the function module of temperature sensor circuit.

Red	Source voltage, 5V
Black	Ground voltage, 0V
Yellow	Output voltage signal

Table 2 Wiring directions for the probe head.

Grey	Source voltage, 5V
Black	Ground voltage, 0V
White	Output voltage signal

4. APPARATUS

Table 3 Apparatus Needed for Testing

Digital multimeter, or equivalent ohmmeter, ammeter, and voltmeter
Power source
Voltage box, with ground (0 volts), -15, +15, and +5 volt outlets

5. LIST OF PARTS

Table 4 Required components

Piece	Value	Unit
LM34 temperature sensor	N/A	N/A
Red wire	N/A	N/A
Black wire	N/A	N/A
Yellow wire	N/A	N/A

6. REFERENCES

NATIONAL SEMICONDUCTOR . (2000) “LM34 Precision Fahrenheit Temperature Sensors” NATIONAL

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