



CURSO: Engenharia Elétrica	TURNO: Diurno	TURMA: _____
DISCIPLINA: Microcontroladores	NATUREZA DO TRABALHO: Aula prática	MÉDIA: 60%
PROFESSOR: Sandro Dornellas	DATA: ____/____/____	VALOR: 100%
ALUNO(A): _____		NOTA:

Aula Prática 9

1. Objetivo

- Esta prática tem por objetivo aplicar os conhecimentos teóricos adquiridos, durante a disciplina de Microcontroladores, a respeito da programação e montagem de hardware na plataforma Arduino.

2. Equipamentos utilizados

- Arduino UNO R3;
- Protoboard;
- Resistores;
- LEDs;
- Botão;
- Display LCD 16x2;
- Sensor de temperatura TMP36.

3. Roteiro

Indicador de Temperatura °C / °F

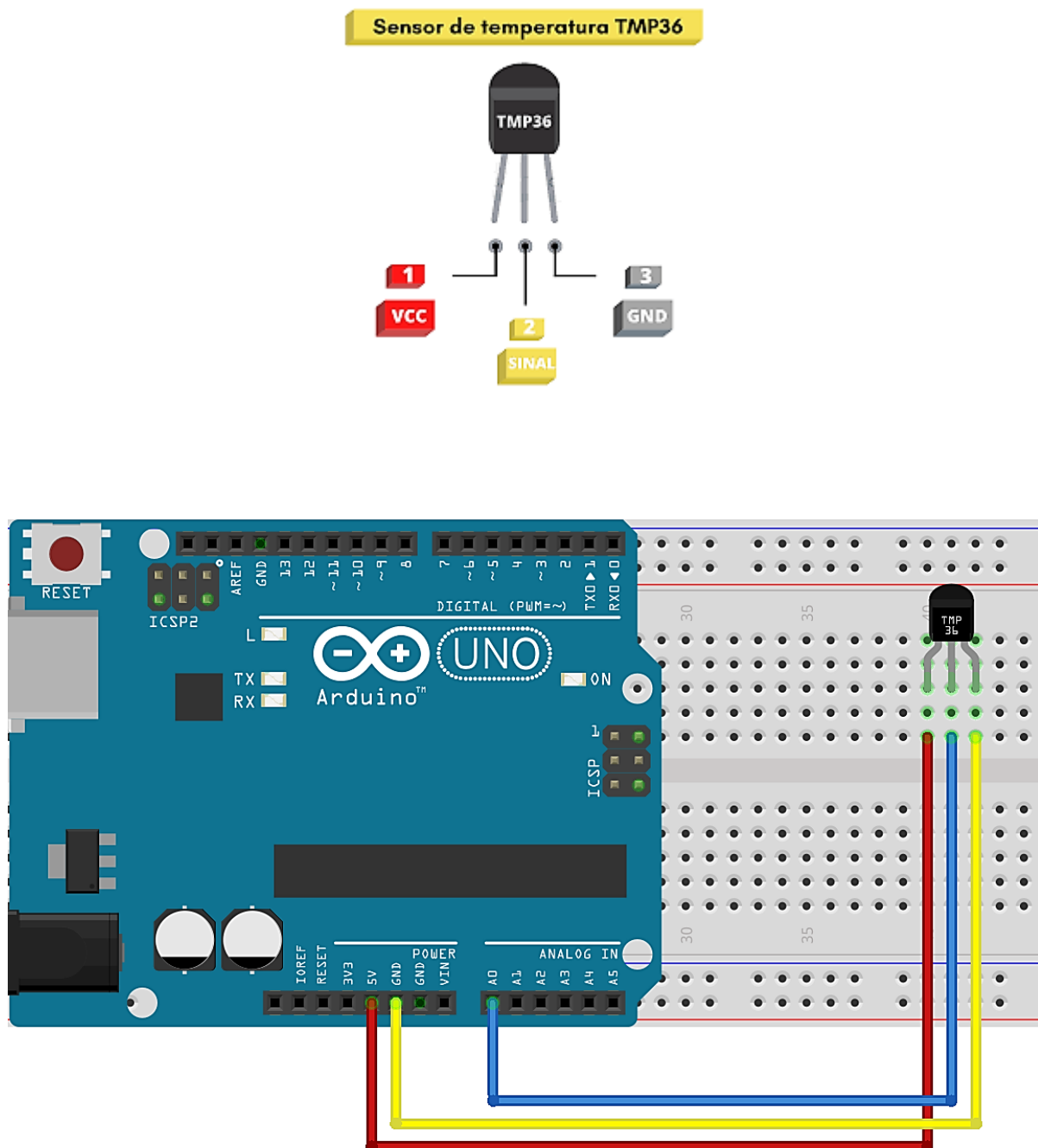
Utilize o Arduino para desenvolver um sistema de indicação de temperatura em °C e °F. O sistema deve conter um sensor de temperatura (TMP36), um display LCD 16 x 2, dois botões e três LED's (verde, azul e amarelo) devendo apresentar as características descritas a seguir.

O sistema só funciona após o botão 1 ser pressionado (pulsado) e o LED verde acenderá. Se o botão 1 for pressionado novamente o sistema para de funcionar e o LED verde apaga.

Utilize um display LCD 16x2 para exibir no monitor a temperatura de leitura (em °C e °F).

O sistema inicia a indicação da temperatura em °C e o LED azul fica aceso até que o botão B2 seja pressionado. Após pressionar (pulsar) o botão 2, o sistema indica a temperatura em °F, o LED azul é apagado e o LED amarelo é aceso até que o botão 2 seja pressionado novamente.

Utilize o sensor TMP36, disponível no TinkerCAD, para simular a variação da temperatura.



FEATURES

- Low voltage operation (2.7 V to 5.5 V)
- Calibrated directly in °C
- 10 mV/°C scale factor (20 mV/°C on **TMP37**)
- ±2°C accuracy over temperature (typ)
- ±0.5°C linearity (typ)
- Stable with large capacitive loads
- Specified -40°C to +125°C, operation to +150°C
- Less than 50 µA quiescent current
- Shutdown current 0.5 µA max
- Low self-heating
- Qualified for automotive applications

APPLICATIONS

- Environmental control systems
- Thermal protection
- Industrial process control
- Fire alarms
- Power system monitors
- CPU thermal management

GENERAL DESCRIPTION

The **TMP35/TMP36/TMP37** are low voltage, precision centigrade temperature sensors. They provide a voltage output that is linearly proportional to the Celsius (centigrade) temperature. The **TMP35/TMP36/TMP37** do not require any external calibration to provide typical accuracies of ±1°C at +25°C and ±2°C over the -40°C to +125°C temperature range.

The low output impedance of the **TMP35/TMP36/TMP37** and its linear output and precise calibration simplify interfacing to temperature control circuitry and ADCs. All three devices are intended for single-supply operation from 2.7 V to 5.5 V maximum. The supply current runs well below 50 µA, providing very low self-heating—less than 0.1°C in still air. In addition, a shutdown function is provided to cut the supply current to less than 0.5 µA.

The **TMP35** is functionally compatible with the LM35/LM45 and provides a 250 mV output at 25°C. The **TMP35** reads temperatures from 10°C to 125°C. The **TMP36** is specified from -40°C to +125°C, provides a 750 mV output at 25°C, and operates to 125°C from a single 2.7 V supply. The **TMP36** is functionally compatible with the LM50. Both the **TMP35** and **TMP36** have an output scale factor of 10 mV/°C.

FUNCTIONAL BLOCK DIAGRAM

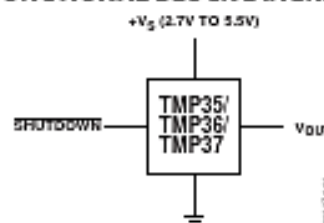


Figure 1.

PIN CONFIGURATIONS

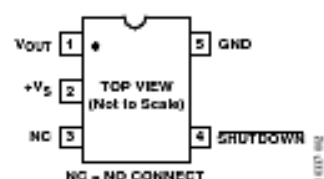


Figure 2. RJ-5 (SOT-23)



Figure 3. R-8 (SOIC_N)



Figure 4. T-3 (TO-92)

The **TMP37** is intended for applications over the range of 5°C to 100°C and provides an output scale factor of 20 mV/°C. The **TMP37** provides a 500 mV output at 25°C. Operation extends to 150°C with reduced accuracy for all devices when operating from a 5 V supply.

The **TMP35/TMP36/TMP37** are available in low cost 3-lead TO-92, 8-lead SOIC_N, and 5-lead SOT-23 surface-mount packages.

Rev. H

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4. Entrega do relatório

O relatório da aula prática deverá ser entregue com os nomes dos integrantes do grupo, os códigos aplicados e a conclusão.