

Ultrasonic Distance Sensors

DT Workshop Equipment Reference — D&T / STEM resource for school workshops | Sensors & Modules

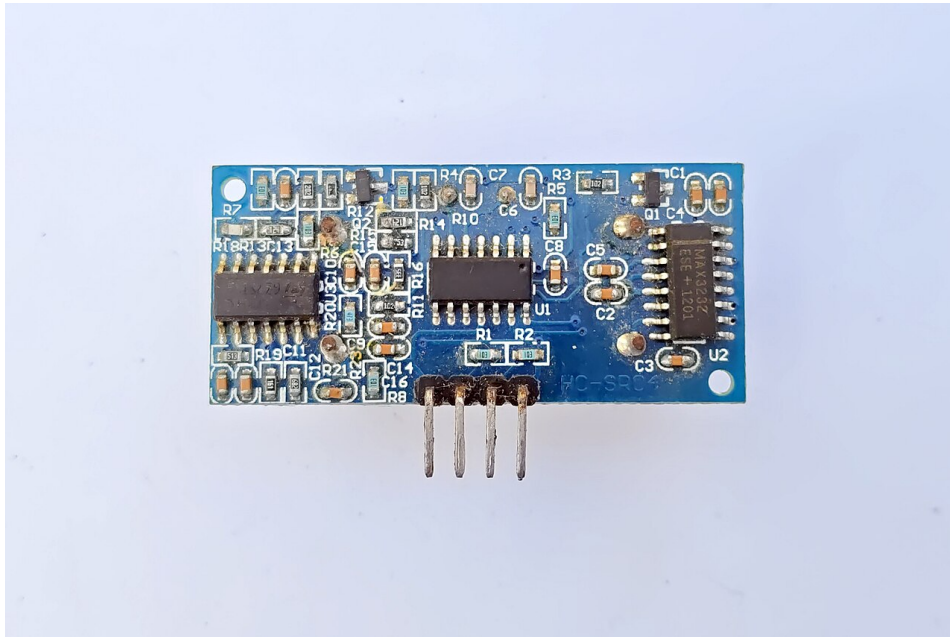


Photo: Suyash Dwivedi — CC BY-SA 4.0 — via Wikimedia Commons (HC-SR04_ultrasonic_distance_sensor_module_pcb.jpg)

An ultrasonic sensor (like the HC-SR04) sends out high-frequency sound pulses and measures the echo time to calculate distance to an object. It is the standard sensor for obstacle-avoiding robots, parking sensors and distance-measuring projects.

Key Features

- Range 2 cm to 4 m typical
- 4-pin connections: VCC, Trig, Echo, GND
- 5 V supply with 3.3 V echo compatibility
- Accuracy around 3 mm at close range
- Wide beam angle about 15 degrees

Typical Uses in the Workshop

- Obstacle avoidance for robots
- Measure tank and bin fill levels
- Build parking sensors and rulers
- Trigger reactions in interactive projects

Safe Operation

1. Fire a 10 microsecond trigger pulse
2. Measure the echo pulse duration
3. Convert the time to distance with the formula
4. Filter readings for noise and averaging
5. Mount the sensor facing the target area

SAFETY NOTES

- Ultrasonic sound is inaudible and safe at these levels
- Keep wiring correctly polarised
- Do not aim at the eyes of people and pets
- Mount away from vibrating parts
- Check the sensor is out of water and moisture

Maintenance & Consumables

- Keep the transducer faces clean
- Check the wiring and connectors
- Test with a known distance regularly
- Protect from dust and humidity
- Store spare sensors in stock

Specification & Buying Notes

HC-SR04 modules are cheap and standard for teaching. Buy quality clones with stable timing, and add a mount bracket or printed holder per robot. A waterproof JSN-SR04T suits outdoor use.