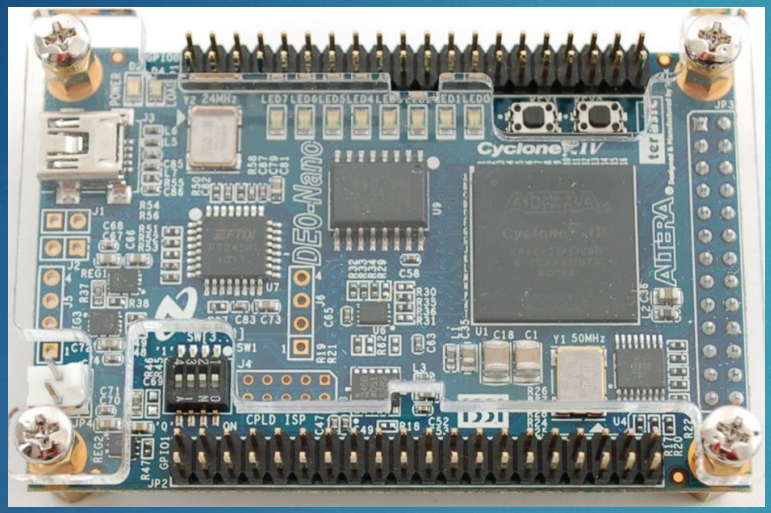
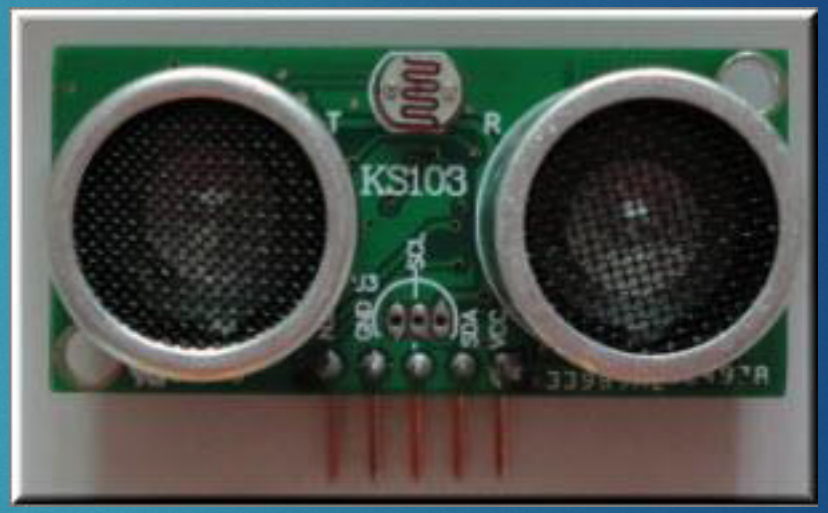
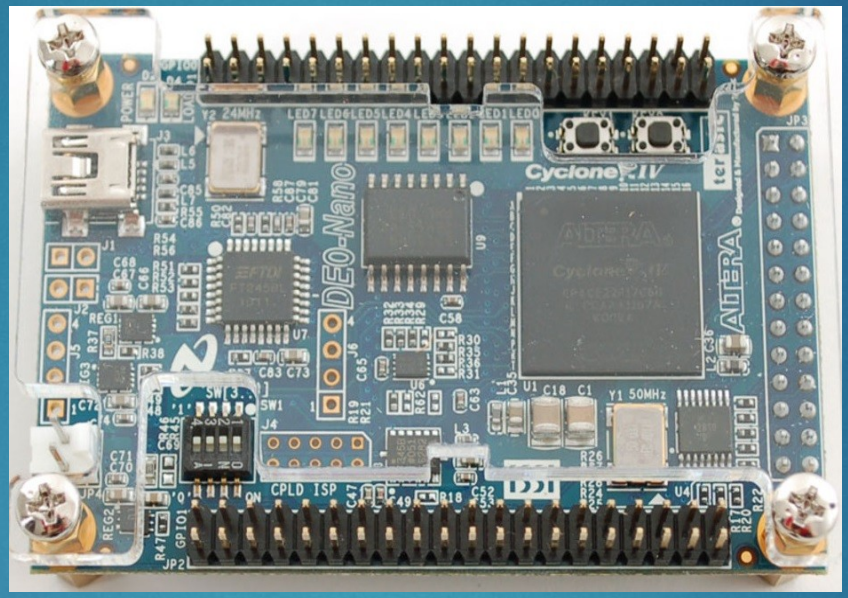
DE0-Nano Board & KS103 Ultrasound Module





Why do we need the Nano Board?



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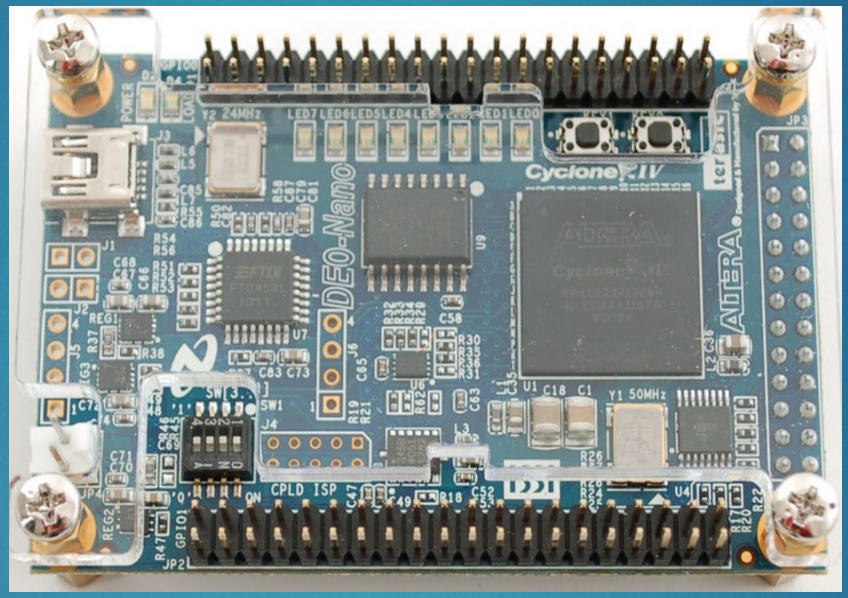
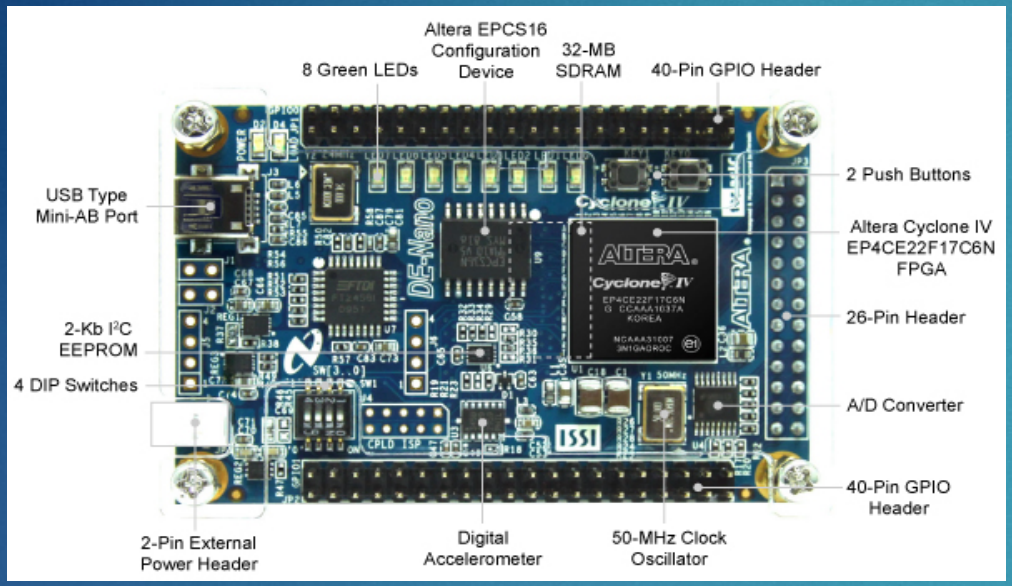
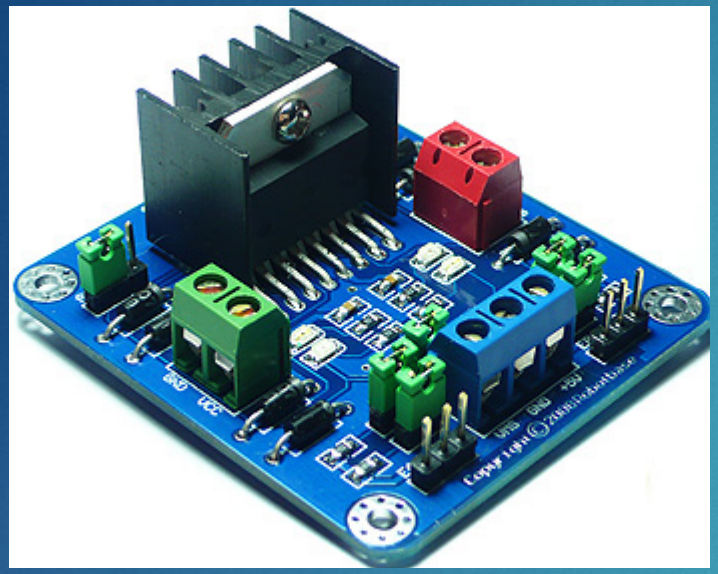


We use the DE0-Nano Board to provide an interface for the Raspberry Pi 3 to control the car

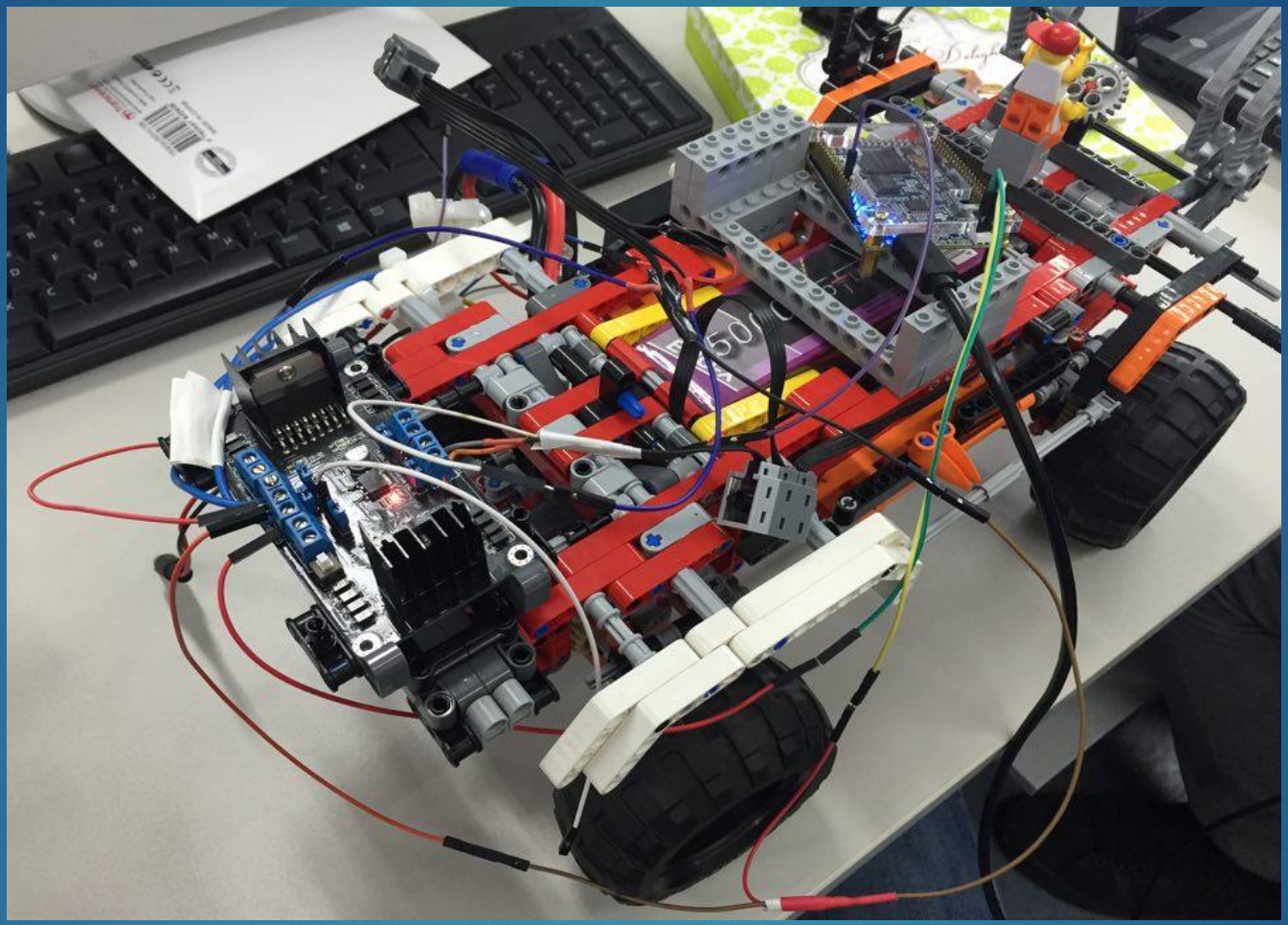
Features of the Board



- **Memory Devices**
  32-MB SDRAM
  2Kb I2C EEPROM
- **General user input/output**
  8 green LEDs
  2 debounced pushbuttons
  4-position DIP switches
- **Expansion header**
  Two 40-pin Headers (GPIOs) provide 72 I/O pins, 5V power pins, two 3.3V power pins and four ground pins
- **Clock system**
  On-board 50MHz clock oscillator
- **Power Supply**
  USB Type mini-AB port (5V)
  DC 5V pin for each GPIO header (2 DC 5V pins)
  2-pin external power header (3.6-5.7V)



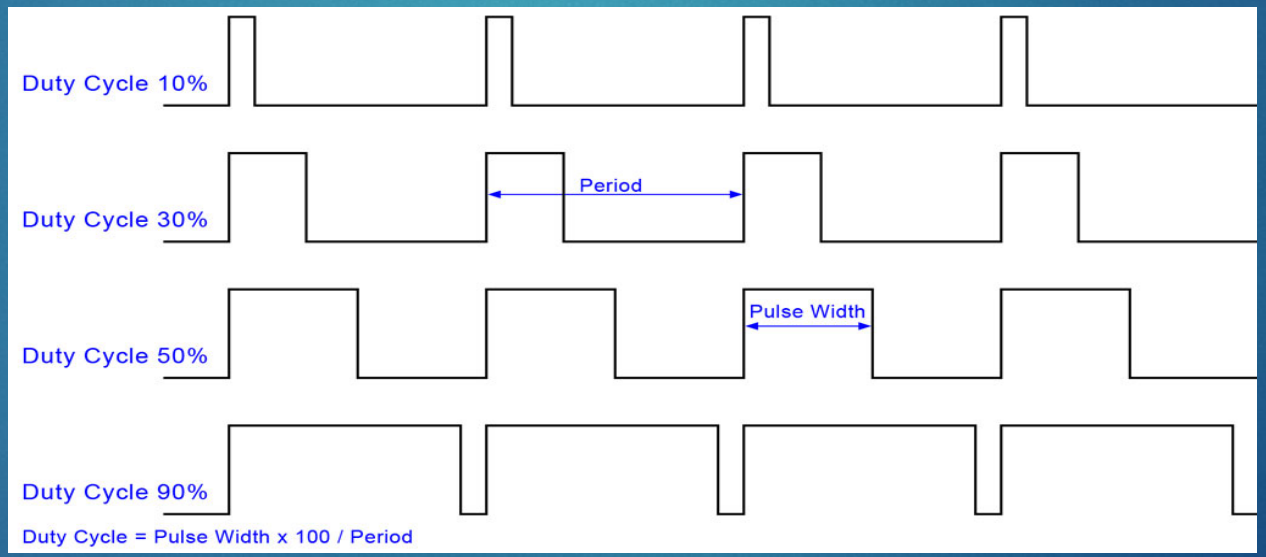
Our Nano board works at 5V, so we use an H-bridge to convert from the battery coming current to 5V.



Connection between the H-Bridge and Nano Board

PWM(Pulse-width Modulation)

- PWM is a modulation technique used to encode a message into a pulsing signal
- The width of the pulse is modulated depending on the requirement



Why do we use the PWM?

The voltage can be changed to control the speed of our motor

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Analog vs Digital Voltage Control

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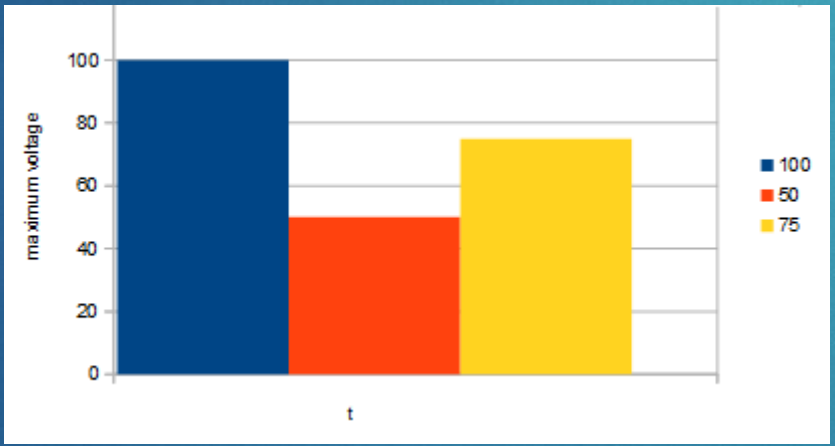
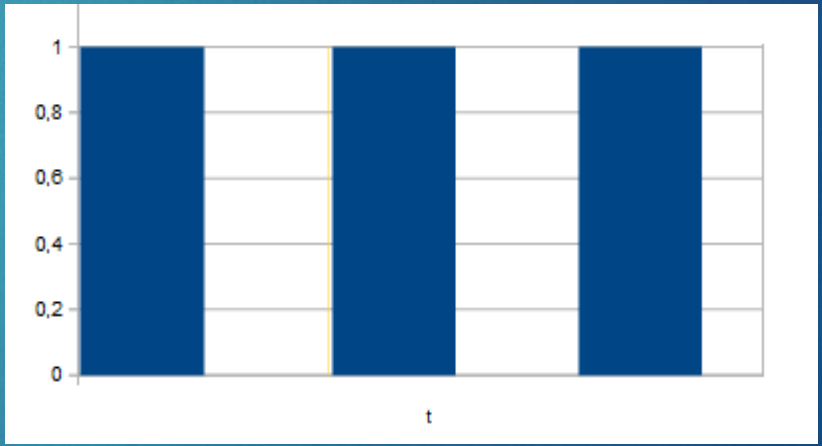
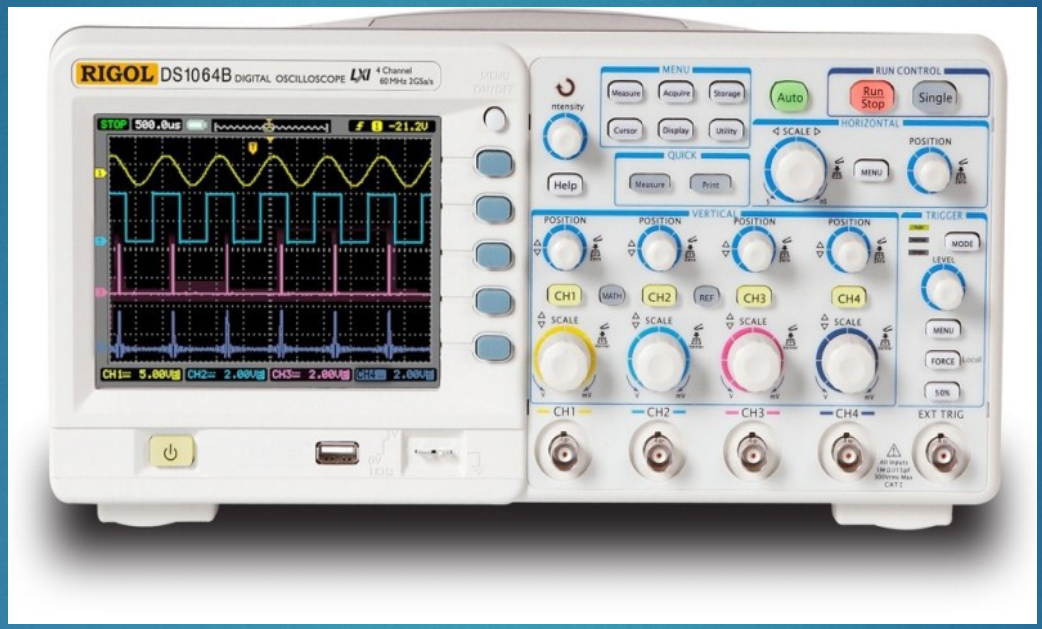


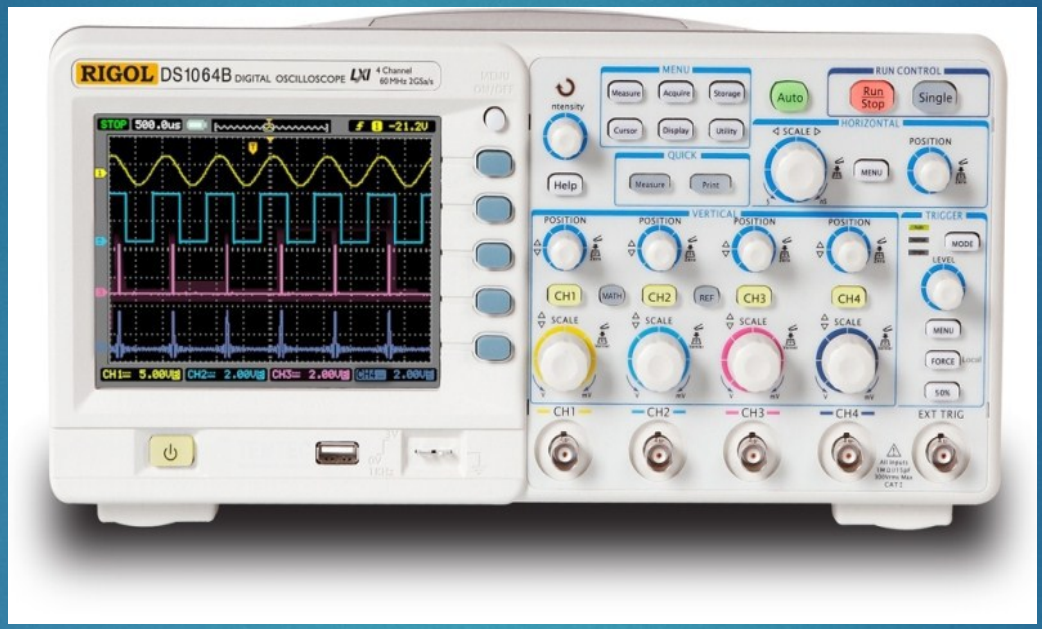


Oscilloscope



We use the oscilloscope to verify the duty cycle

Oscilloscope



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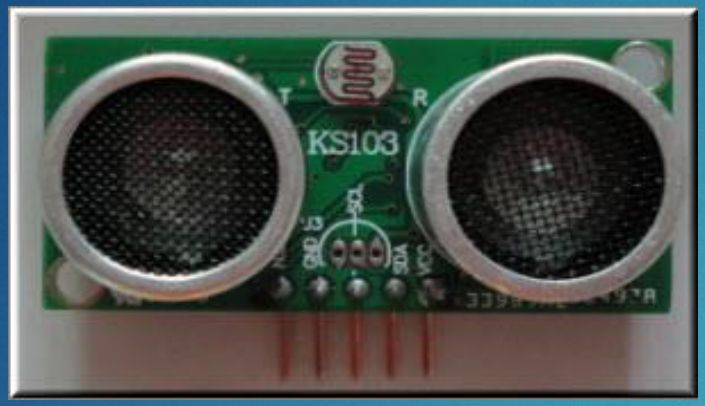
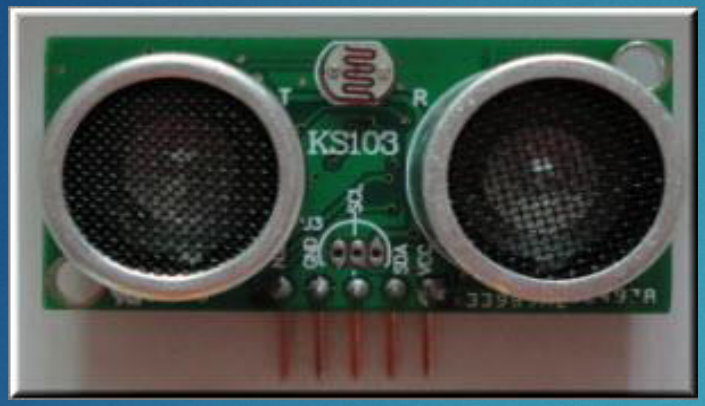
Link to Lego Car

KS103 Ultrasound Module



We use this device to measure the distance between our car and the obstacle

KS103 Ultrasound Module



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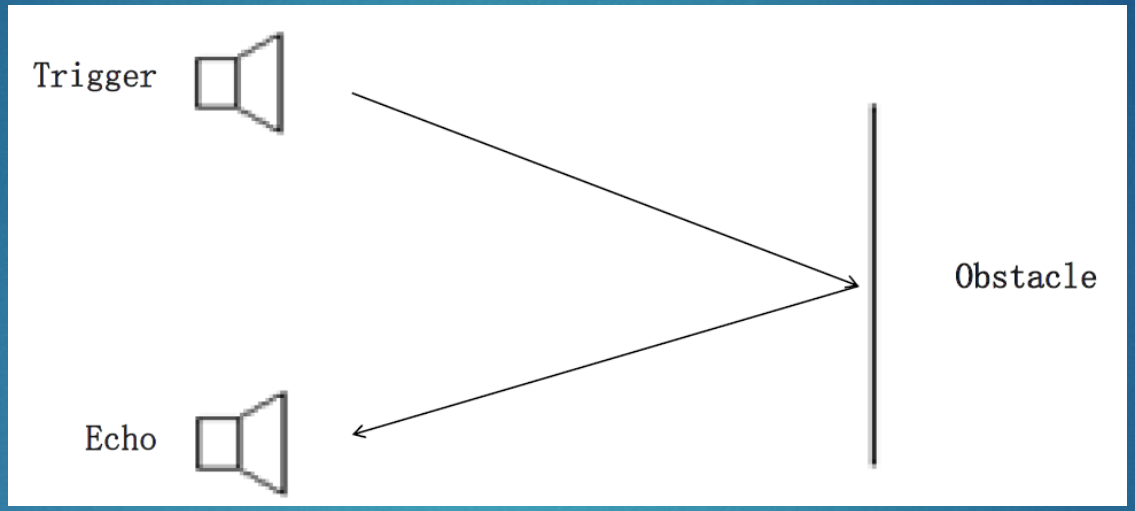
Pins

- VCC: power pin
- SDA/TX: data pin
- SCL/RX: clock pin
- GND: power ground pin
- Mode: selects the communication mode

How It Works?



The trigger sends chirps and then the device calculates the distance by using this formula: (340(m/s) x Δt(s)) / 2)

Connection of Three Modules

Our task was to connect three modules with each other