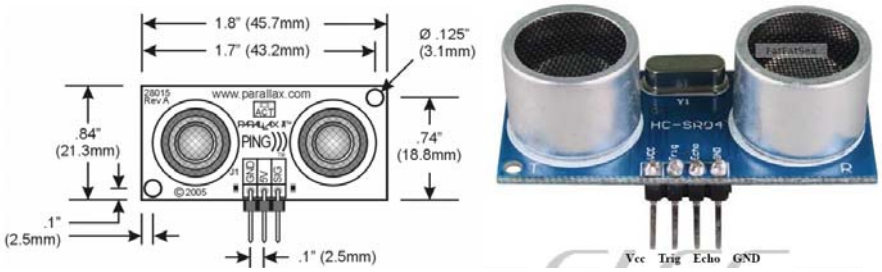
"When working on a software development team, everyone needs to be constantly reminded what is blindingly obvious."
Tim Fields, UT EE grad, Lead Designer for Brute Force at Microsoft

Working in teams,
"Everything you think is blindingly obvious is wrong."
Tim Fields, UT EE grad, Lead Designer for Brute Force at Microsoft



Ping))) distance sensor

There is one **SIG** pin used for both output and input.

Ping))) 10 times a second

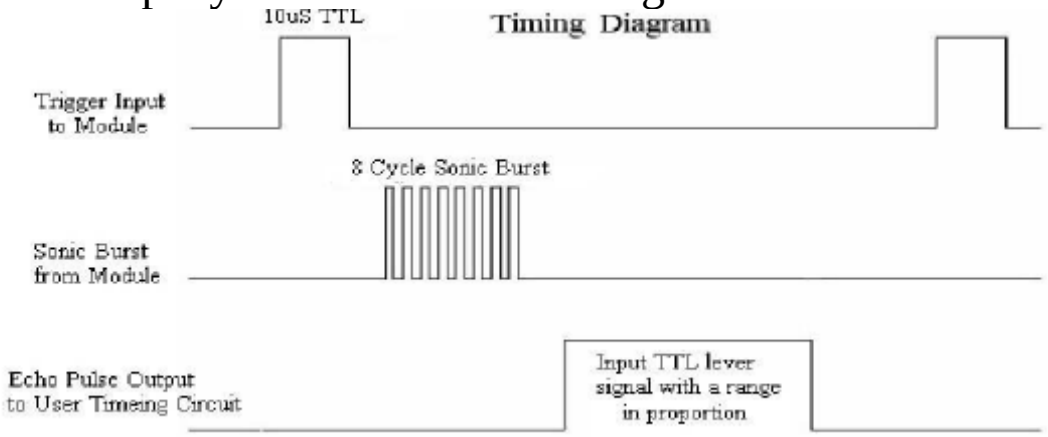
0) disable interrupts
1) make the **SIG** pin an output;
2) issue a 5 μs output pulse (causing a sound pulse);
3) switch the **SIG** pin to back to an input;
4) enable interrupts
5) measure the time until the echo is received
   Busy-wait if foreground task
   Interrupt synchronization if background task.

HCSR04 distance sensor

There are two signals **Trig** output and **Echo** input.

HCSR04 10 times a second

0) disable interrupts
1) issue a 10 μs **Trig** output pulse (causing a sound pulse);
2) enable interrupts
3) measure the time until the echo is received
   Busy-wait if foreground task
   Interrupt synchronization if background task.



$\mathbf{t_{IN}}$ is the time for the sound to travel to the object, reflect and travel back to the sensor.

$\mathbf{t_{IN}}$ will be a pulse width measurement using input capture.
$\mathbf{t_{IN}} = 2\ \mathbf{d}/\ \mathbf{c}$

therefore
$\mathbf{d}=\mathbf{c}^*\ \mathbf{t_{IN}}/2$,
c is the speed of sound.
perform this measurement about 10 times per second.

You will need 5V to power **Ping))) HCSR04**
Use a five volt tolerance pin to interface the **Ping))) HCSR04**.

Sharp GP2Y0A21YK

You will need 5V to power **IR sensor**

Needs analog LPF

- Reduces noise
- Analog input protection

Needs digital median filter (refer to

Needs 10 µF or larger Vcc to gnd cap for each sensor

Advice for the power supply

- In order to stabilize power supply line, we recommend to insert a by-pass capacitor of 10µF or more between Vcc and GND near this product.

Calibration, fixed point d (0.01 cm)

d (cm)	1/d	ADC
10	0.100	703
15	0.067	484
20	0.050	380
30	0.033	260

ADC = 6707/d+40
d = 6707/(ADC-40)
d (0.01cm) = 6706700/(ADC-40)