Seminario de Diseño y Construcción de Microrrobots

Departamento Electrónica

SENSORES

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Universidad de Alcalá

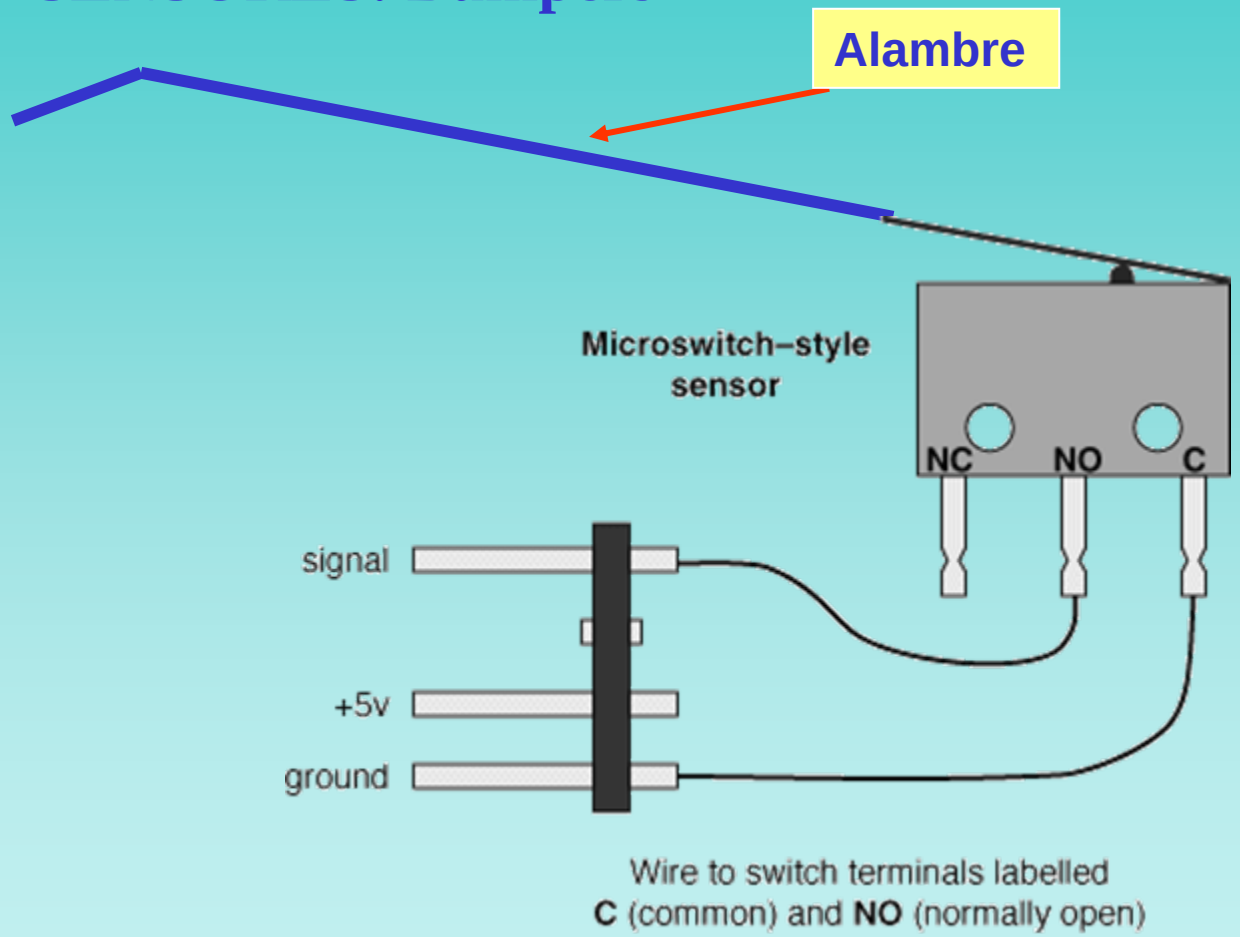
SENSORES ... ¿PARA QUÉ?

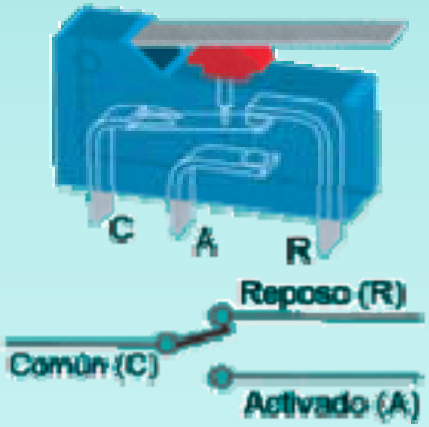
- Detección de obstáculos
- Seguimiento de trayectorias
- Buscar un objeto
- Mantener velocidad constante en el desplazamiento
- Determinar la orientación del robot

Sensores de contacto

DISEÑO MICRORROBOTS

SENSORES: Bumpers

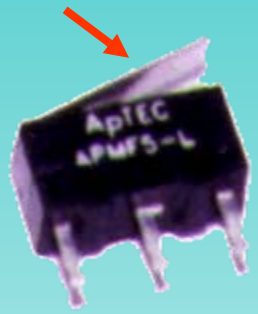


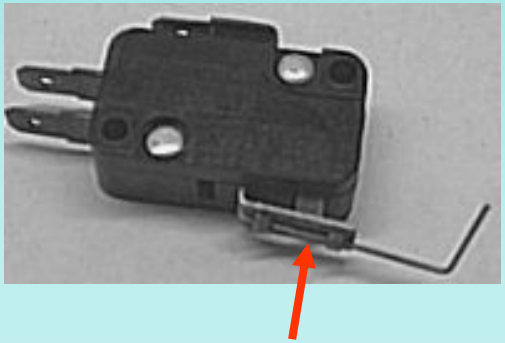


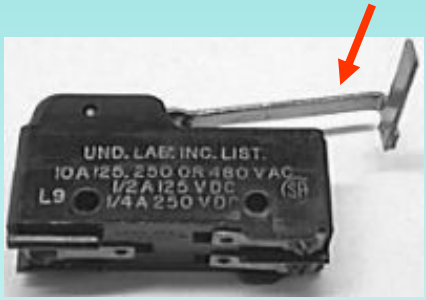
Sensores de contacto

DISEÑO MICRORROBOTS

SENSORES: Bumpers



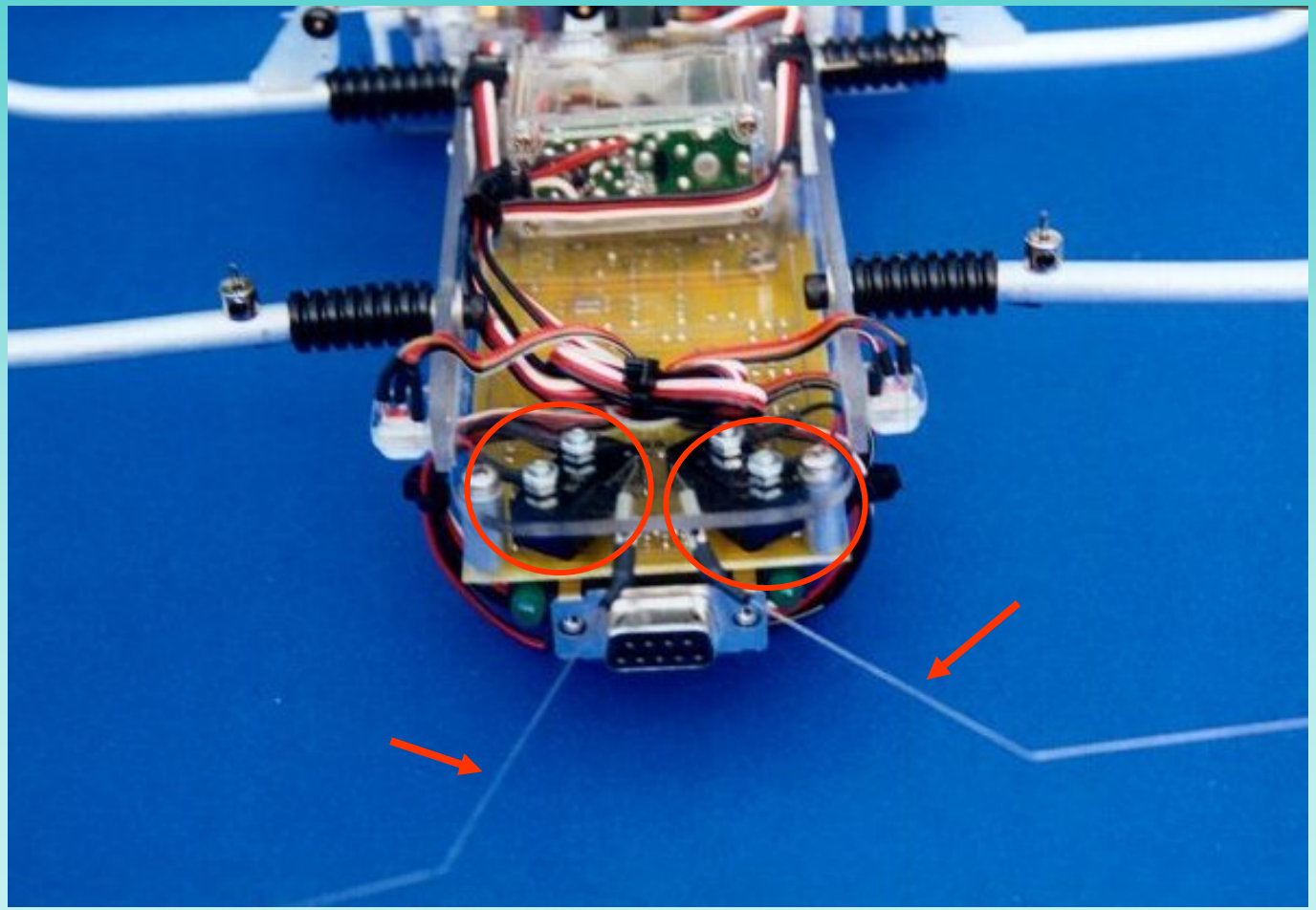




Sensores de contacto

DISEÑO MICRORROBOTS

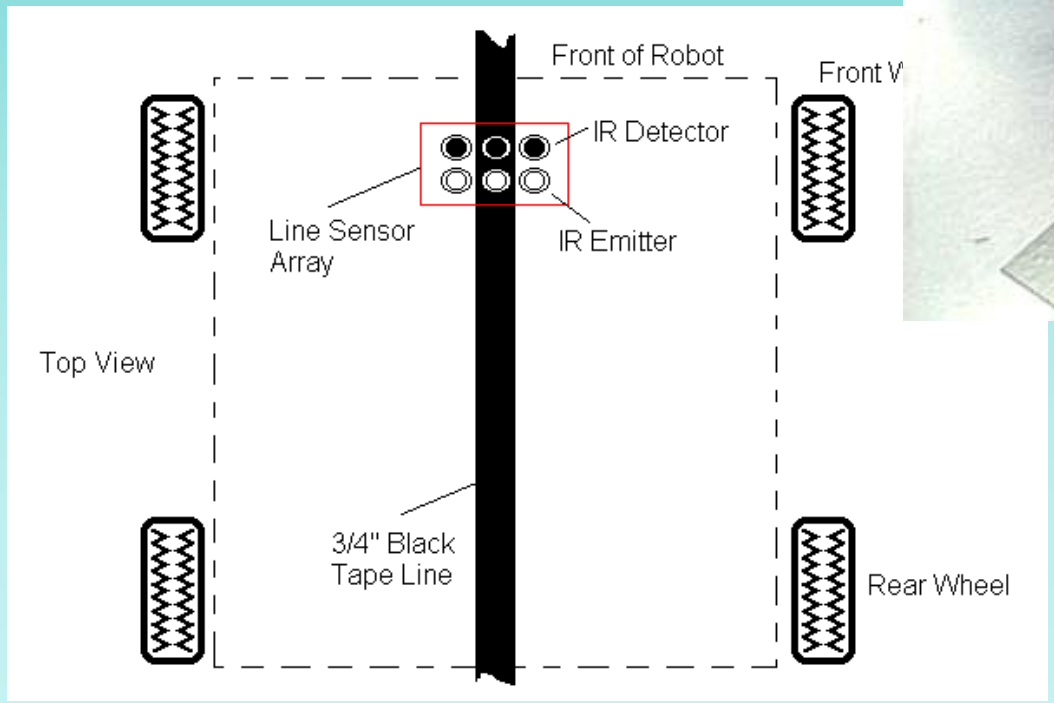
SENSORES: Bumpers

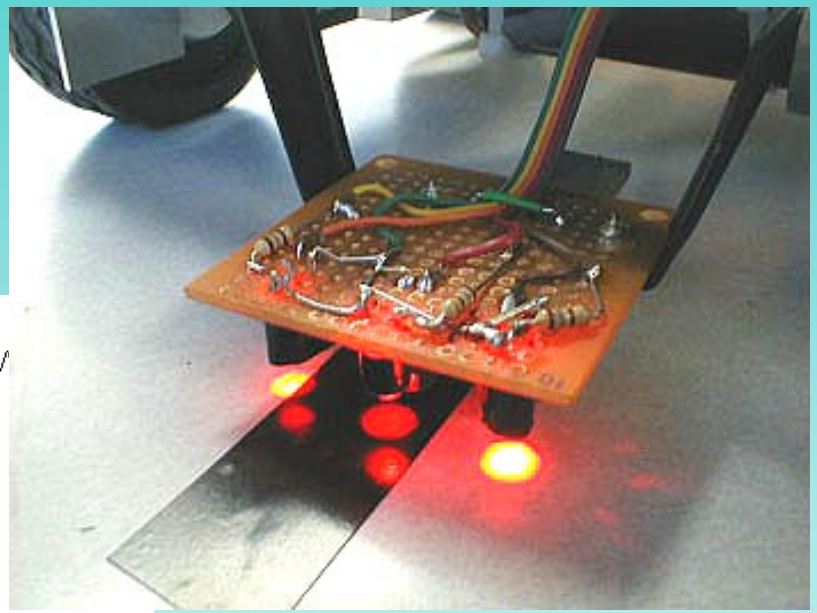


Sensores reflectivos de infrarrojos

DISEÑO MICRORROBOTS

SENSORES: Detector de línea por infrarrojos

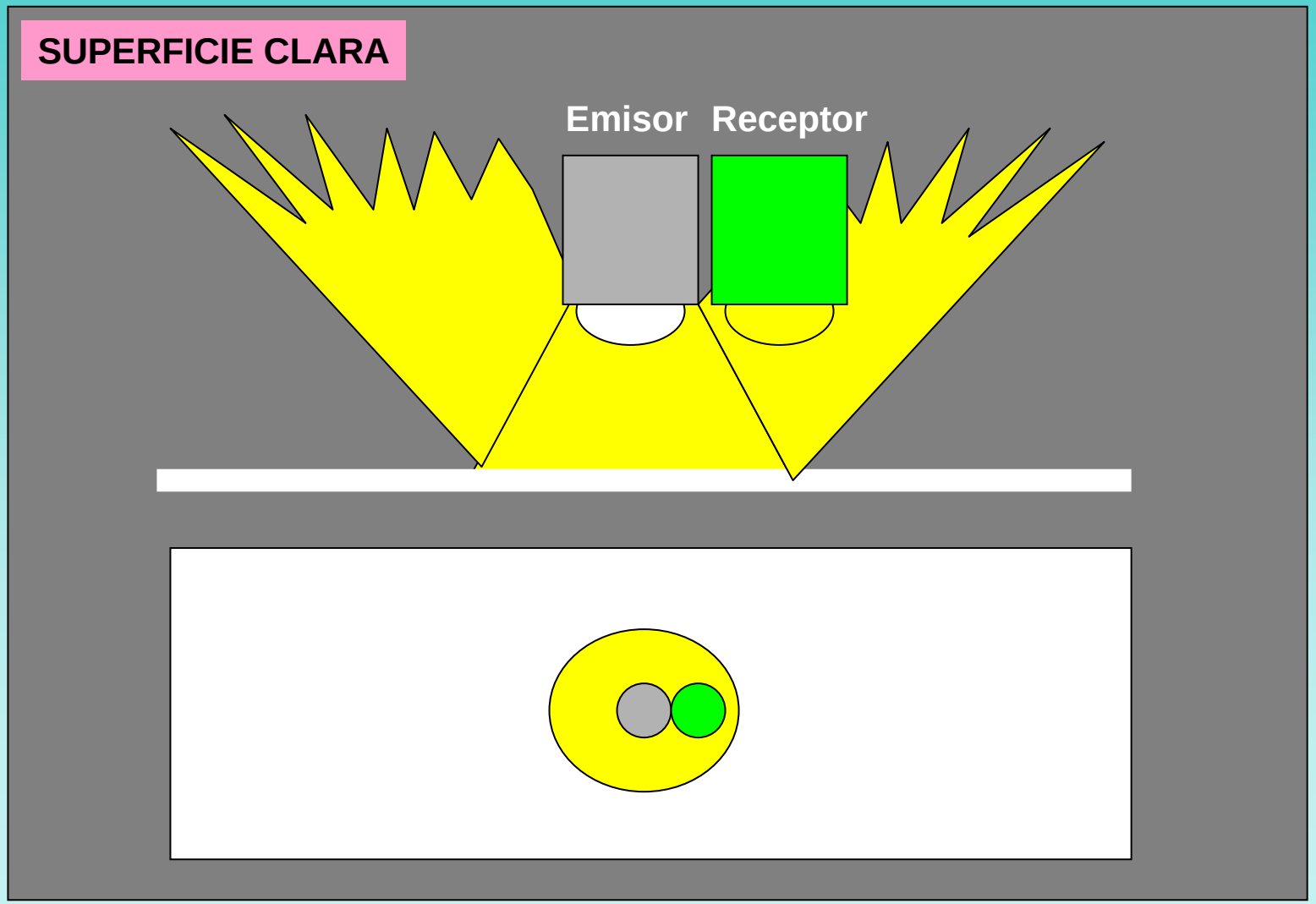




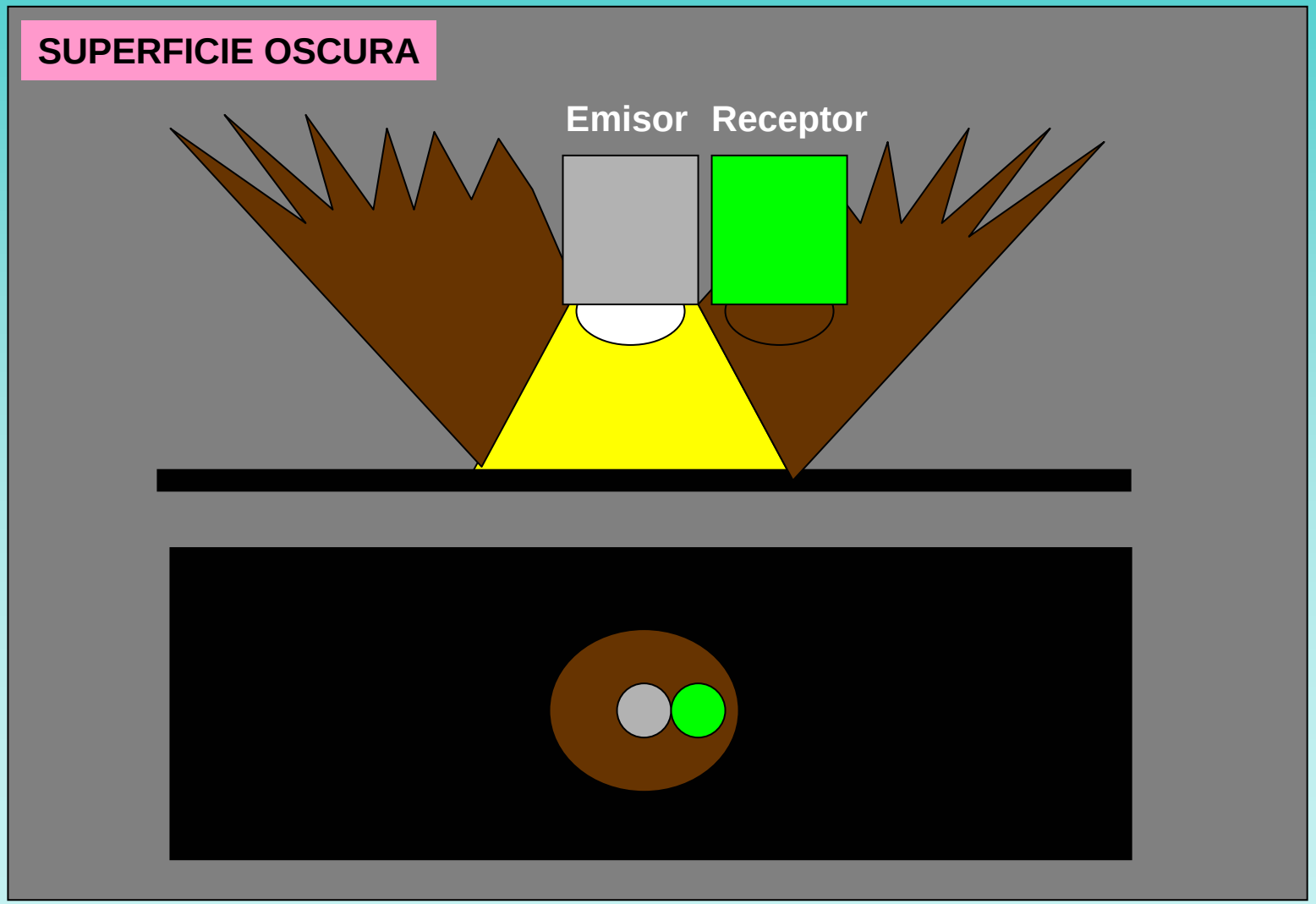
Sensores reflectivos de infrarrojos

DISEÑO MICROROBOTS

SENSORES: Detector de línea por infrarrojos

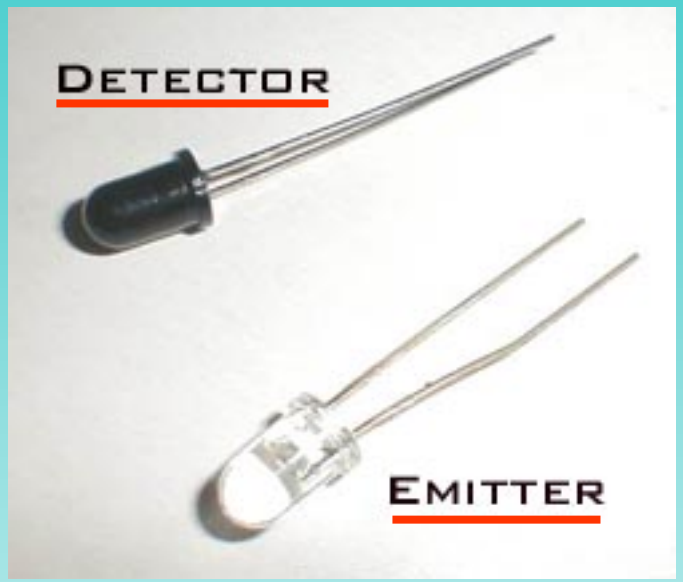


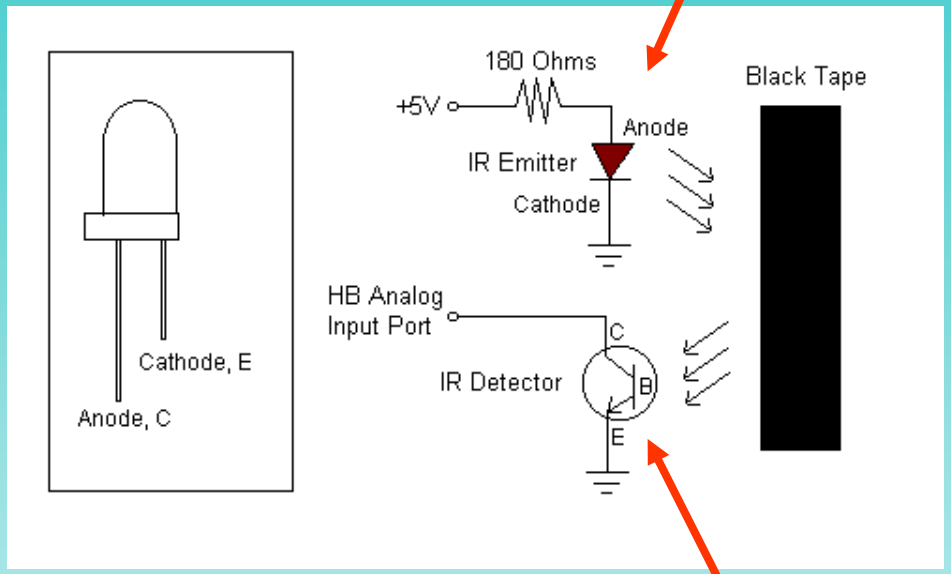
SENSORES: Detector de línea por infrarrojos

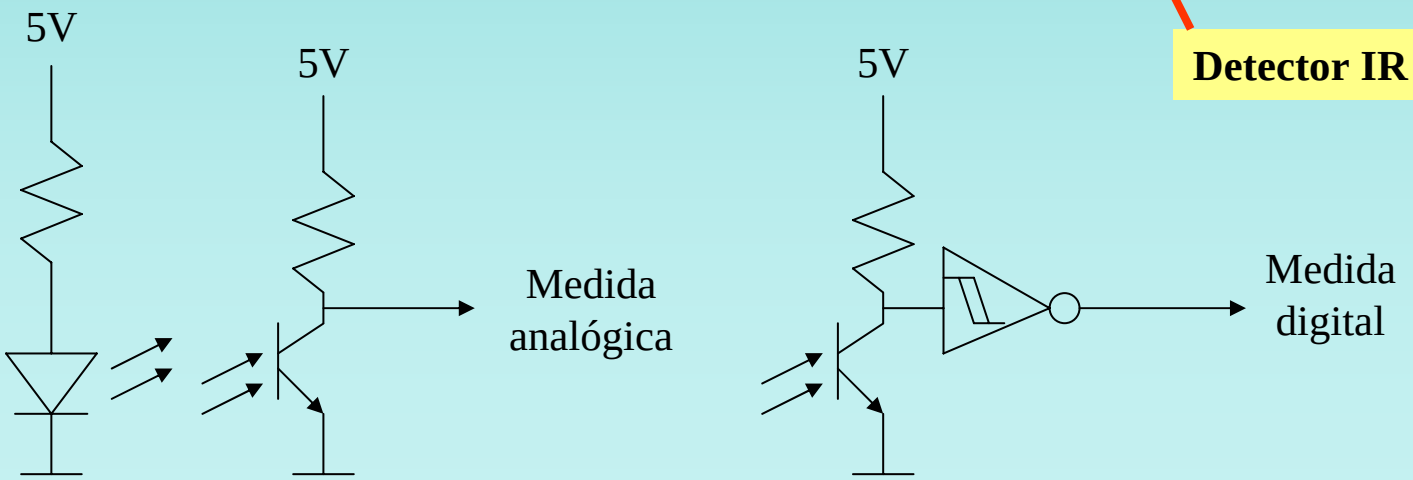


Sensores reflectivos de infrarrojos

DISEÑO MICRORROBOTS







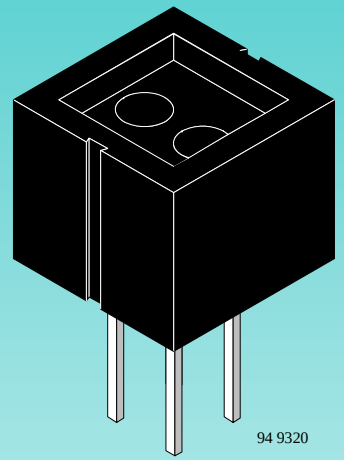
Sensores reflectivos de infrarrojos

DISEÑO MICRORROBOTS

SENSORES: Detector de línea por infrarrojos

– www.vishay.com Reflective Optical Sensor

CNY-70



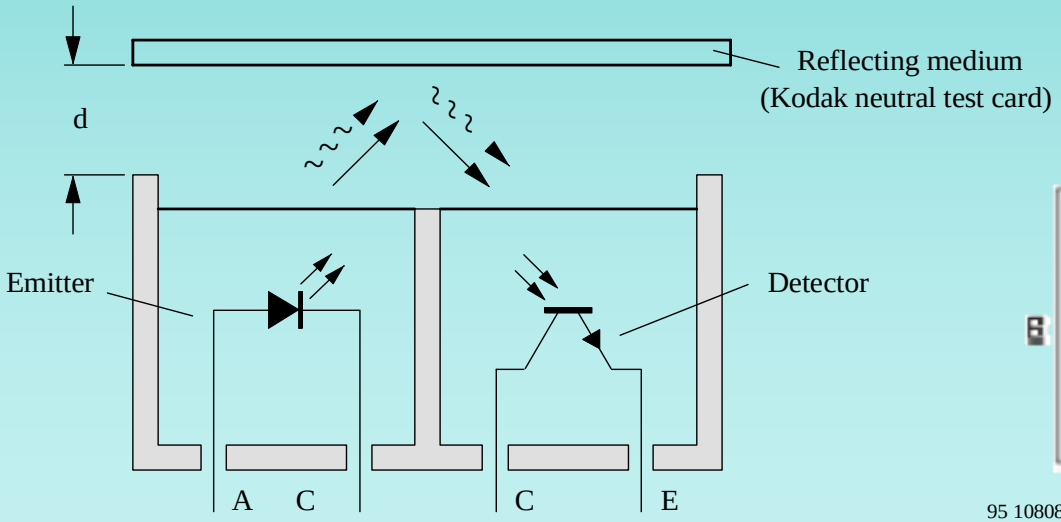
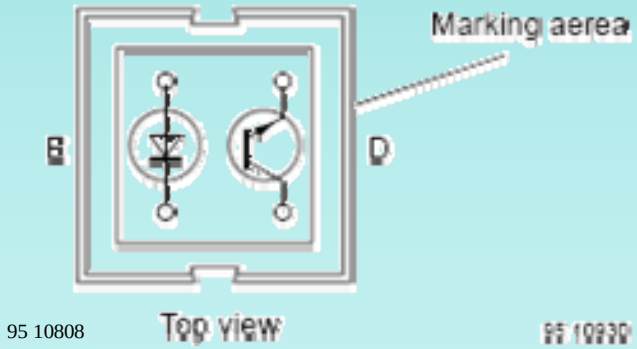


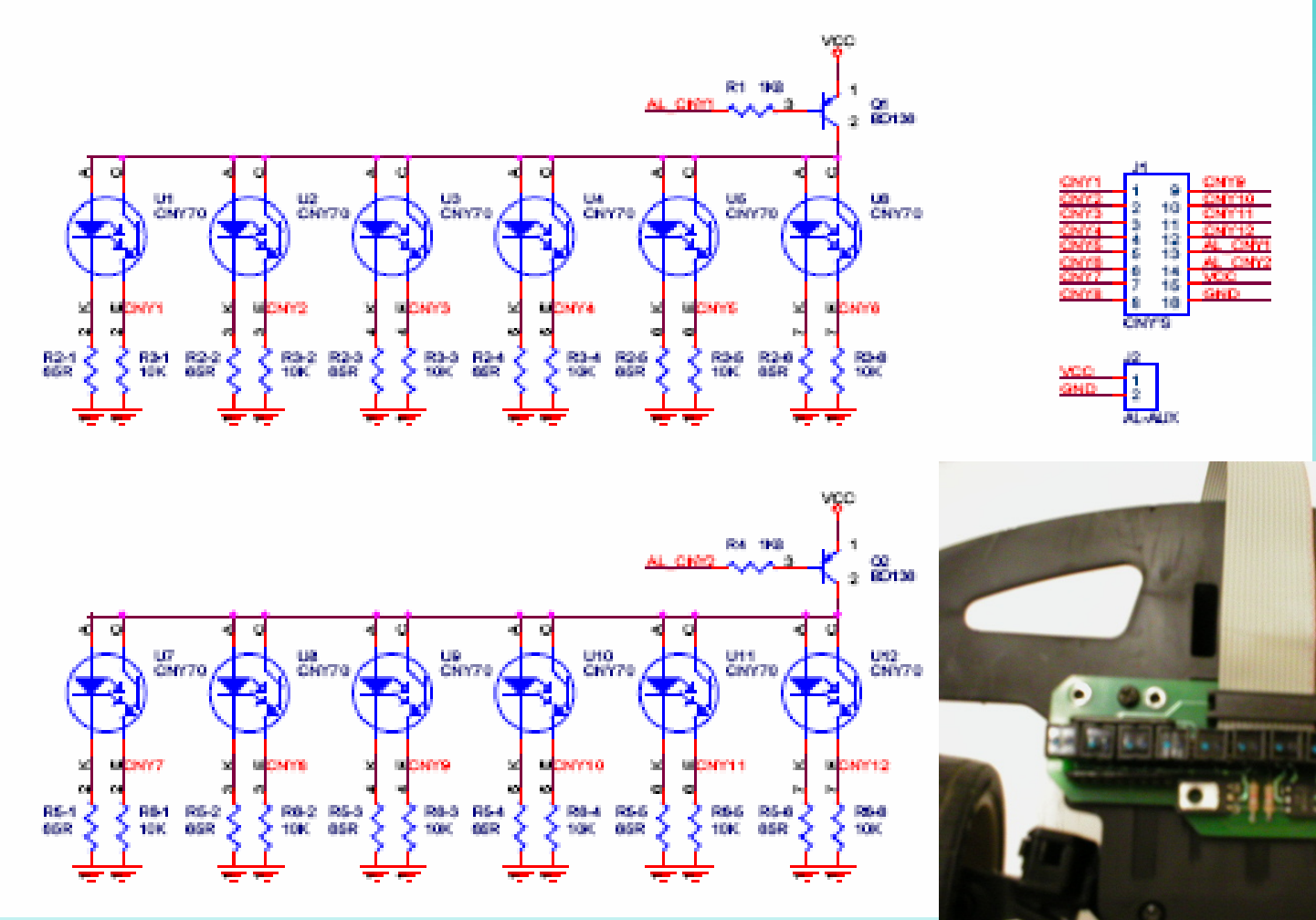
Figure 1. Test circuit

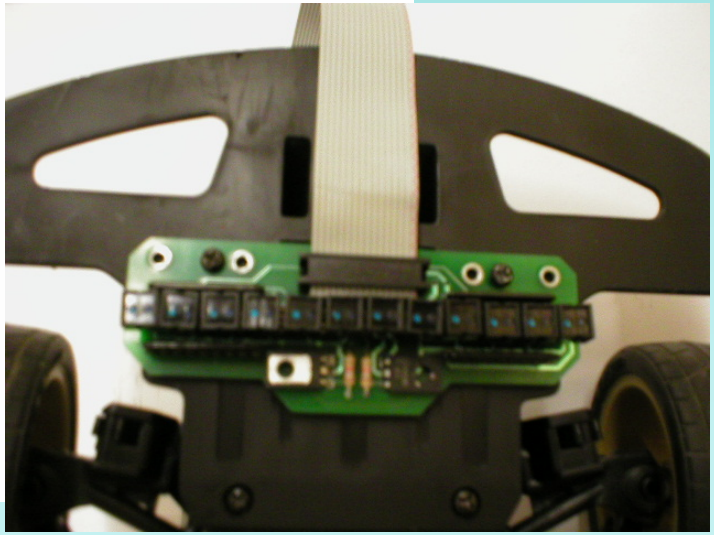


Sensores reflectivos de infrarrojos

DISEÑO MICRORROBOTS

SENSORES: Detector de línea por infrarrojos





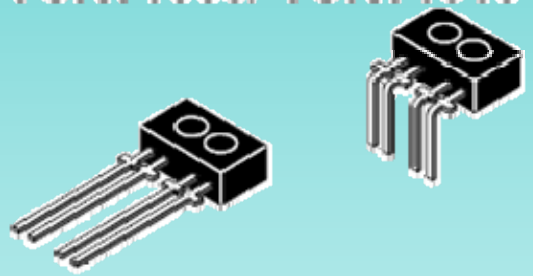
Sensores reflectivos de infrarrojos

DISEÑO MICRORROBOTS

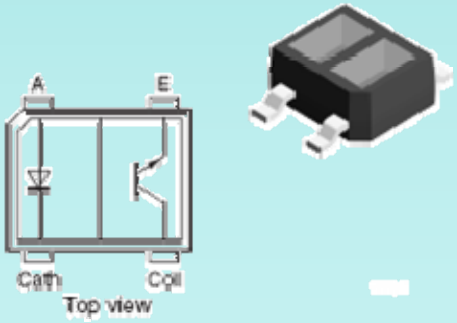
Detector de línea por infrarrojos o detección de proximidad

– www.vishay.com Reflective Optical Sensors

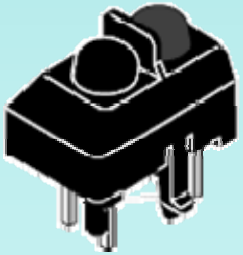
TCRT1000/ TCRT1010



TCNT1000



TCRT5000

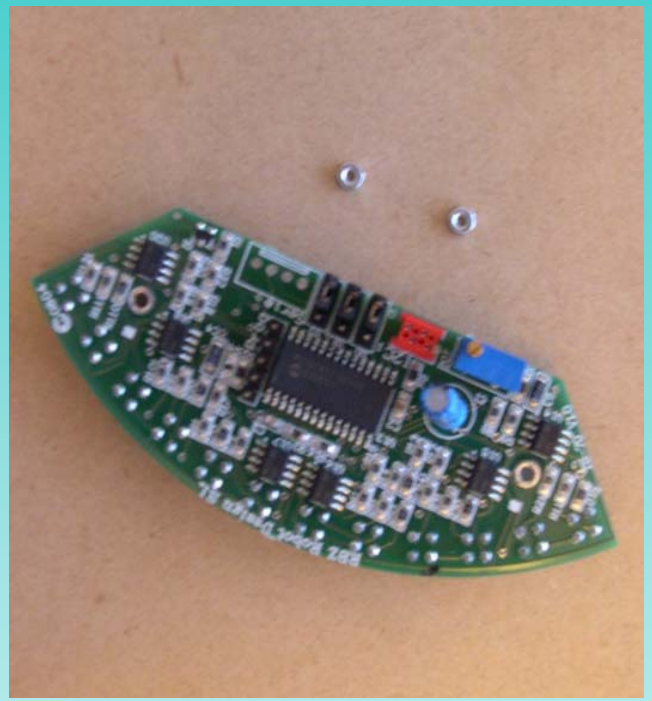


SENSORES: Array de sensores IR (TS70)

DISEÑO MICROROBOTS

TS70

- 12 sensores CNY70
- Lectura múltiple
- Comunicación por I2C
- Ahorro de consumo:
  - 12 CNY70 = 300mA
  - TS70 < 40 mA
- Hasta 8 TS70's en el mismo Bus, con diferentes direcciones



Software

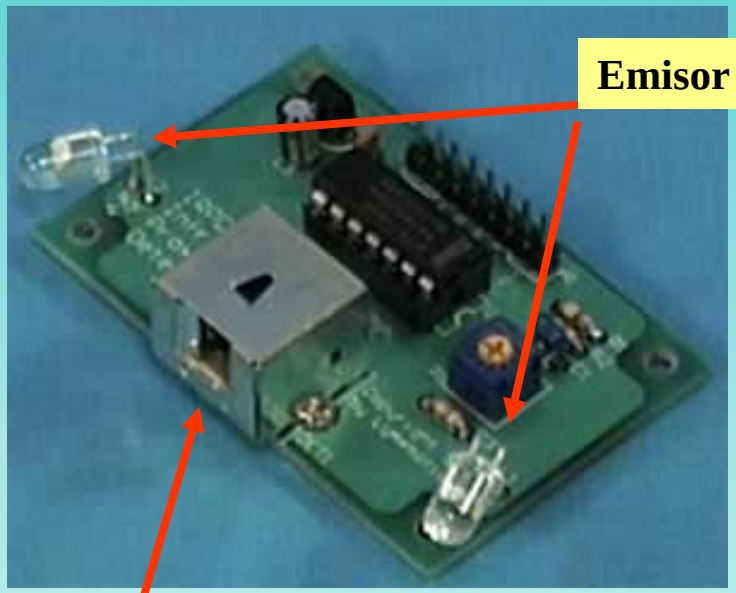
```
char ReadTs70(char address,char *left,char *right)
```

S1 S2 S3 S4 S5 S6 S7 S8 S9 S10 S11 S12

Left: 0 0 b5 b4 b3 b2 b1 b0 Right: 0 0 b5 b4 b3 b2 b1 b0

Detector de obstáculos por infrarrojos

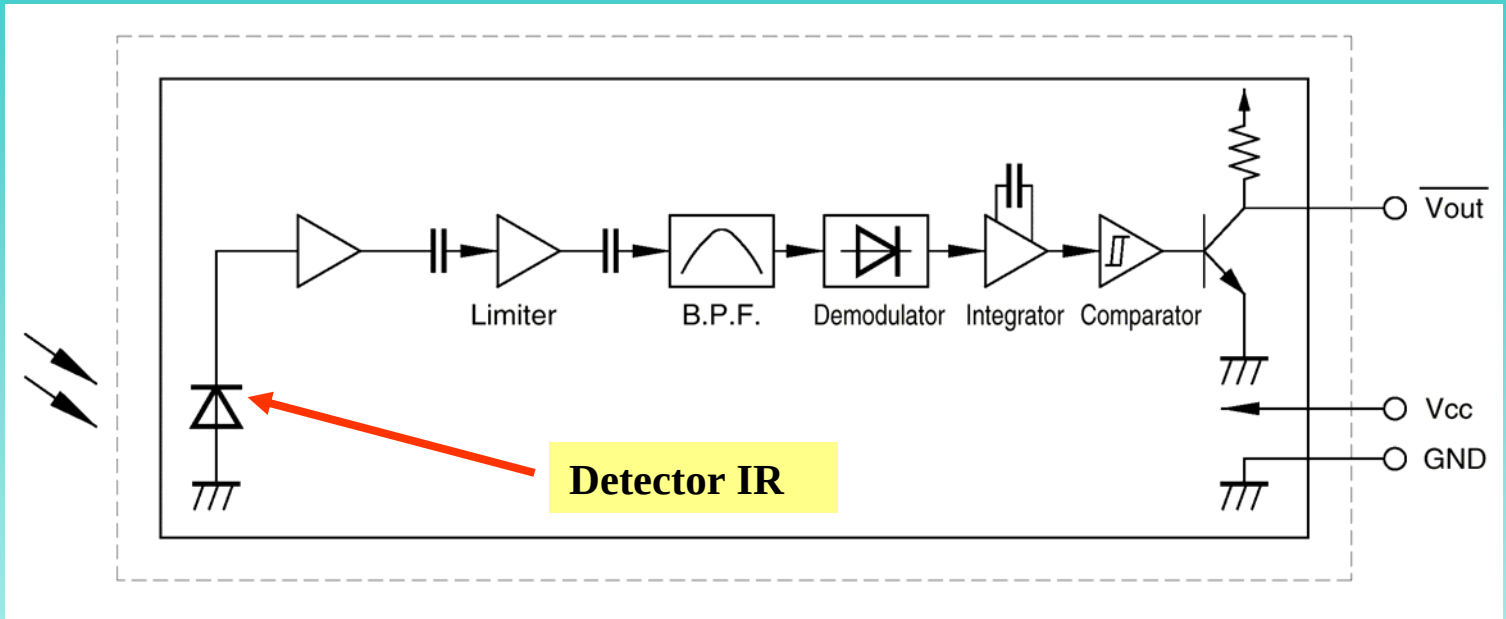
DISEÑO MICRORROBOTS



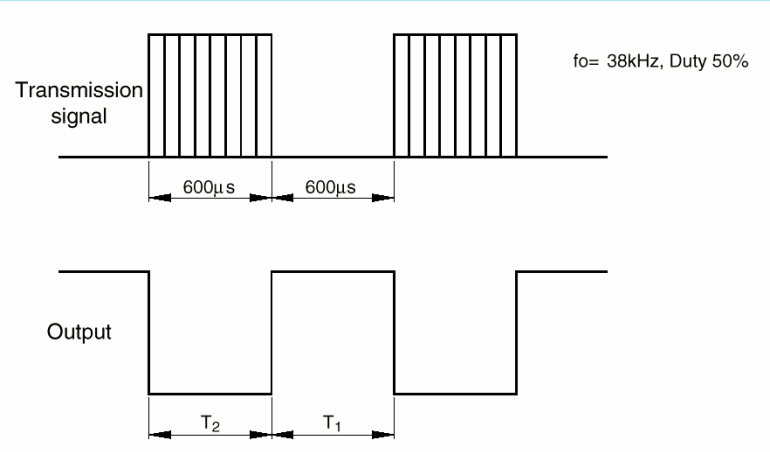
GP1U52X → Circuito receptor de mando a distancia de infrarrojos

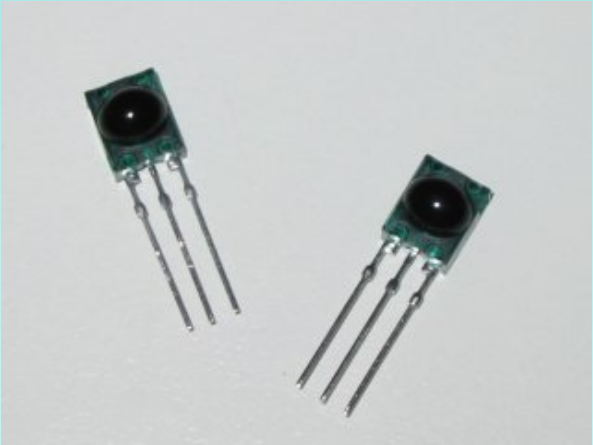
Detector de infrarrojos IS1U60/GP1U5x

DISEÑO MICRORROBOTS



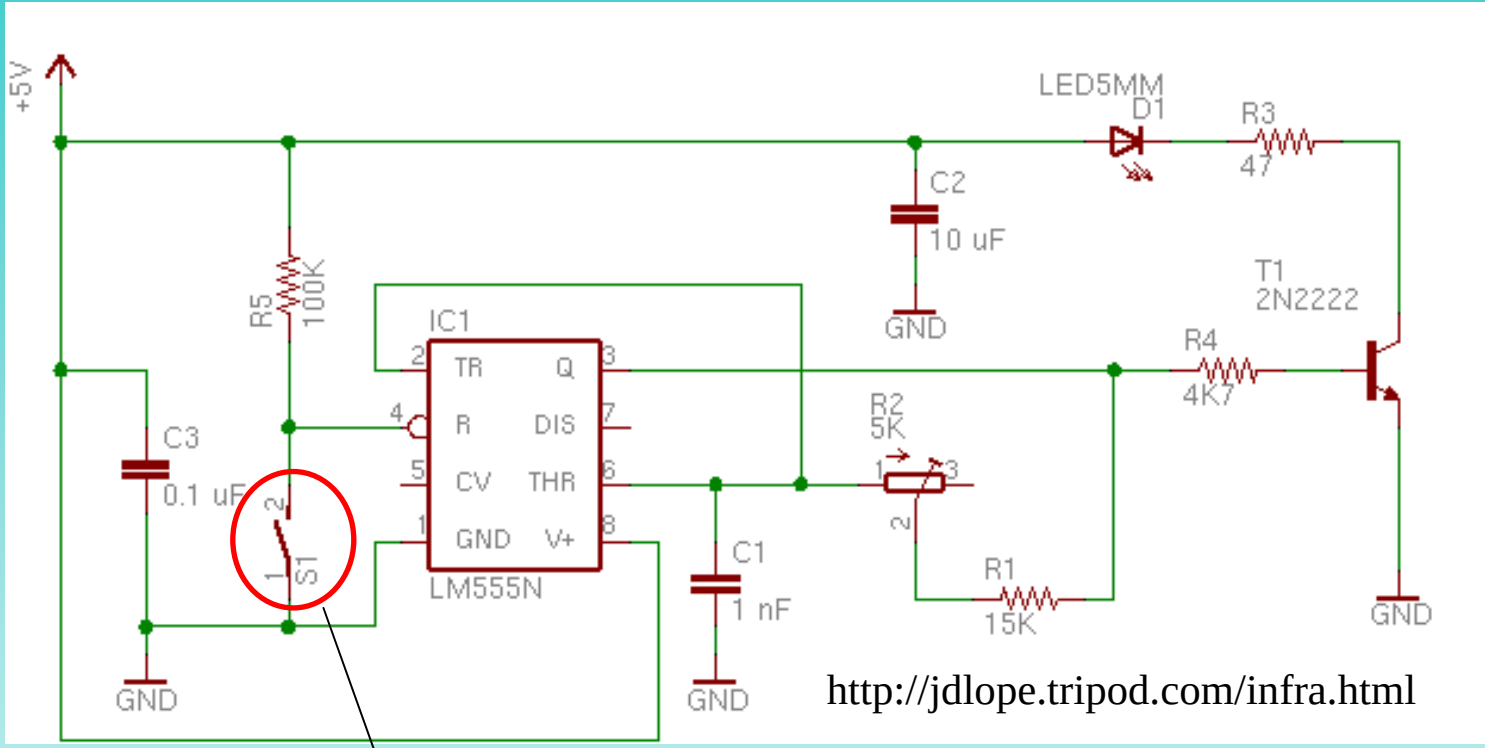
Modulación de la señal





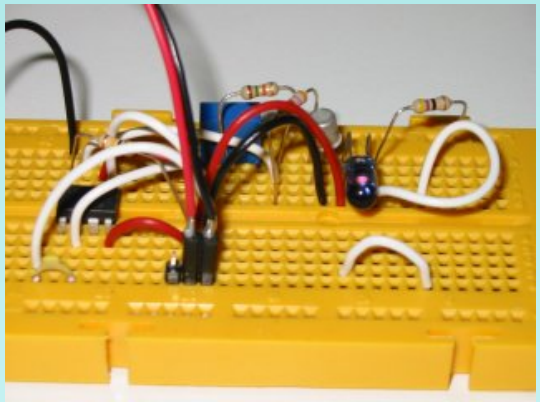
Generador de una portadora de infrarrojos

DISEÑO MICROROBOTS



Activando el Reset con otro 555 se puede generar una señal moduladora

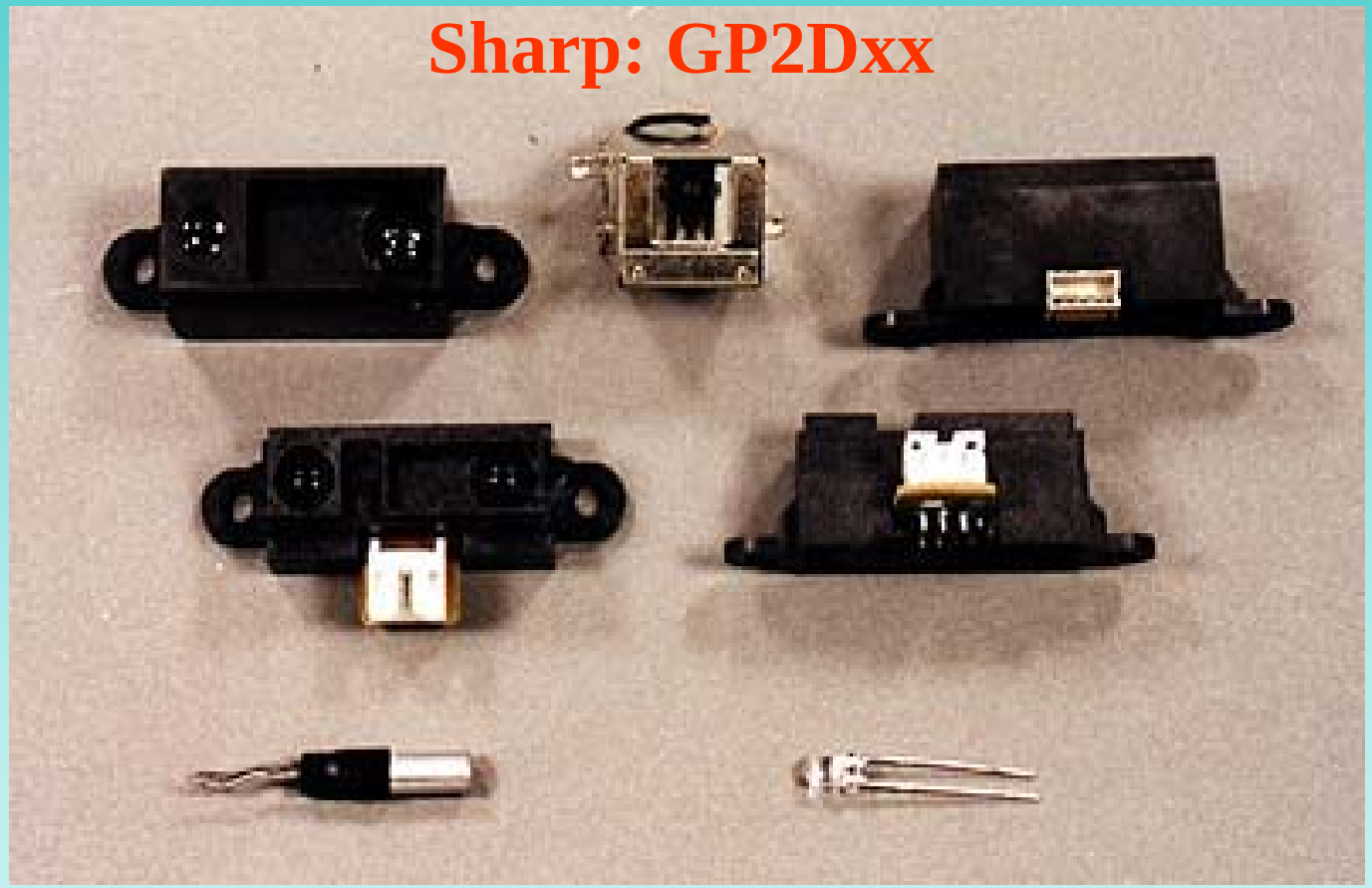
Esta señal se puede generar también con un microcontrolador



Medida de distancia

DISEÑO MICRORROBOTS

Medidores de distancia por infrarrojos



Medida de distancia

DISEÑO MICRORROBOTS

Medidores de distancia por infrarrojos

DETECTOR	TIPO DE SALIDA	RANGO	HABILITACIÓN
GP2D02	**SERIE SÍNCRONA**	**10-80cm**	**Cada lectura se dispara por un reloj externo**
GP2D05	**DIGITAL (1- 0) Umbral de distancia**	**10-80cm con umbral ajustable potenciómetro interno**	**Cada lectura se dispara a través de una señal externa**
GP2D12	**ANALÓGICA (0-3V)**	**10-80cm**	**Lecturas continuas cada 38ms.**
GP2D15	**DIGITAL (0-1)**	**Ajustado de fábrica a 24cm**	**Lecturas continuas cada 38ms.**

Medida de distancia

DISEÑO MICRORROBOTS

Medidores de distancia por infrarrojos

Principio de funcionamiento

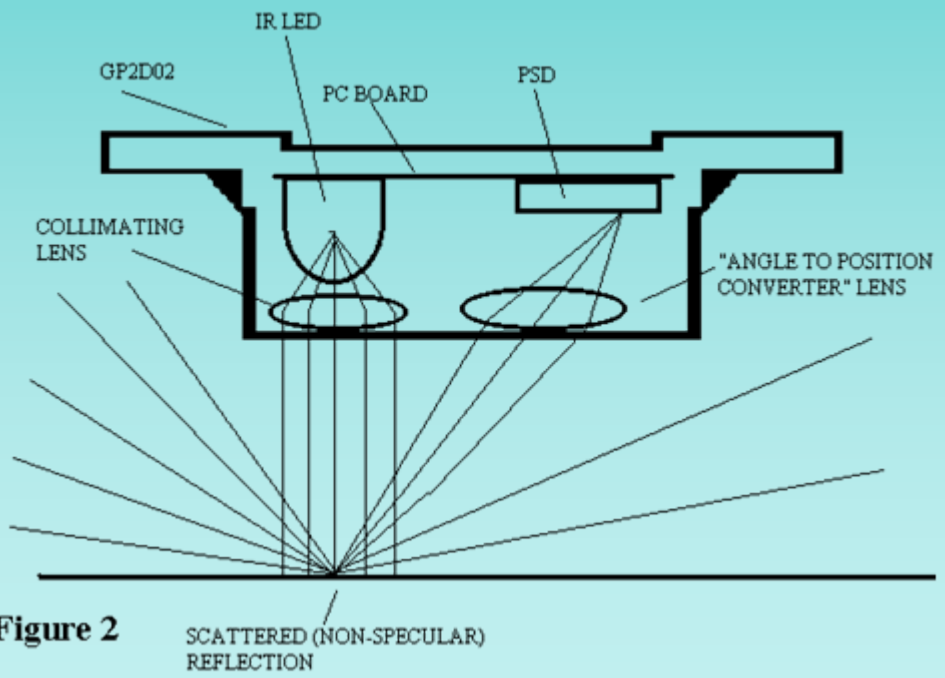
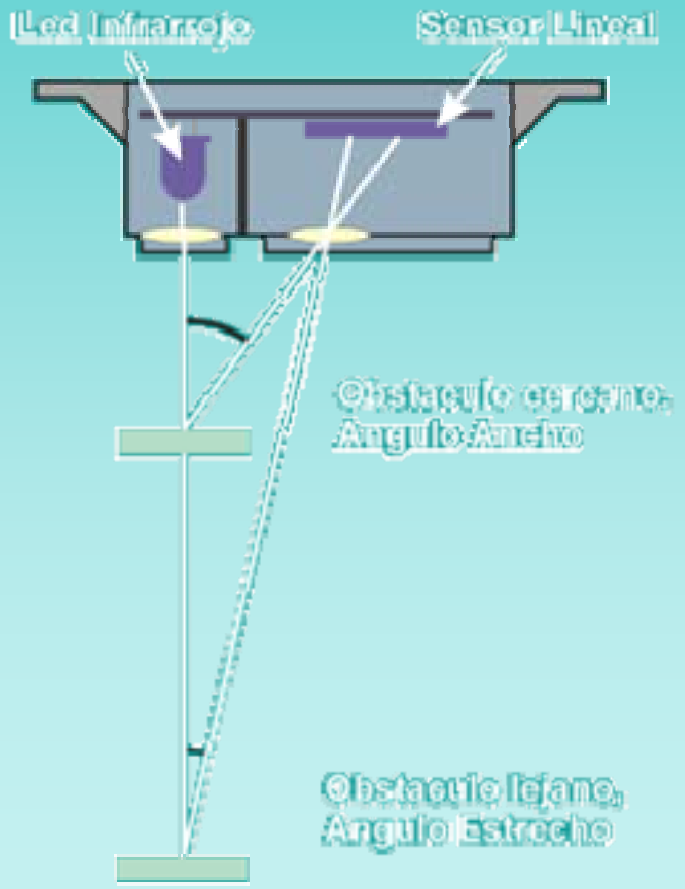


Figure 2

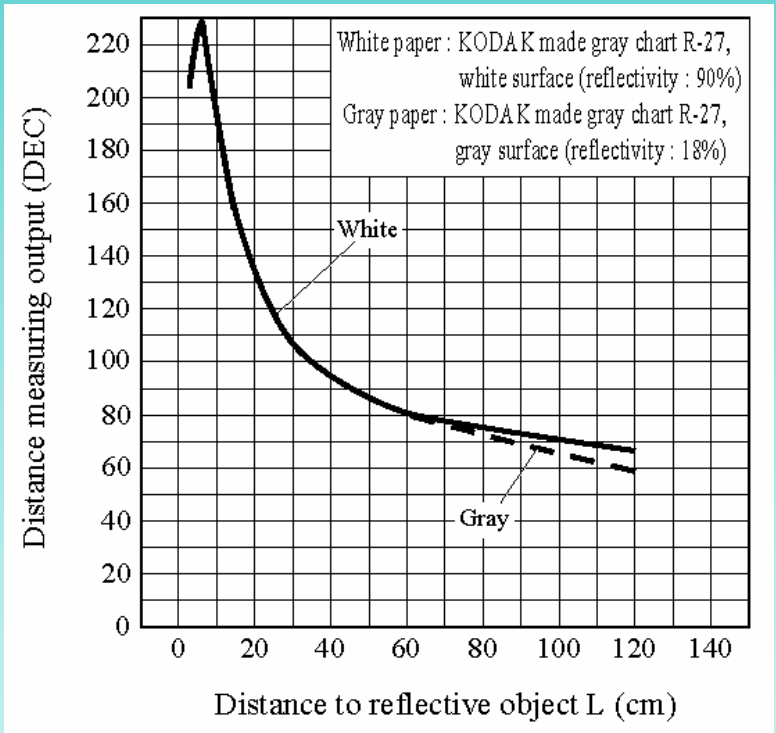


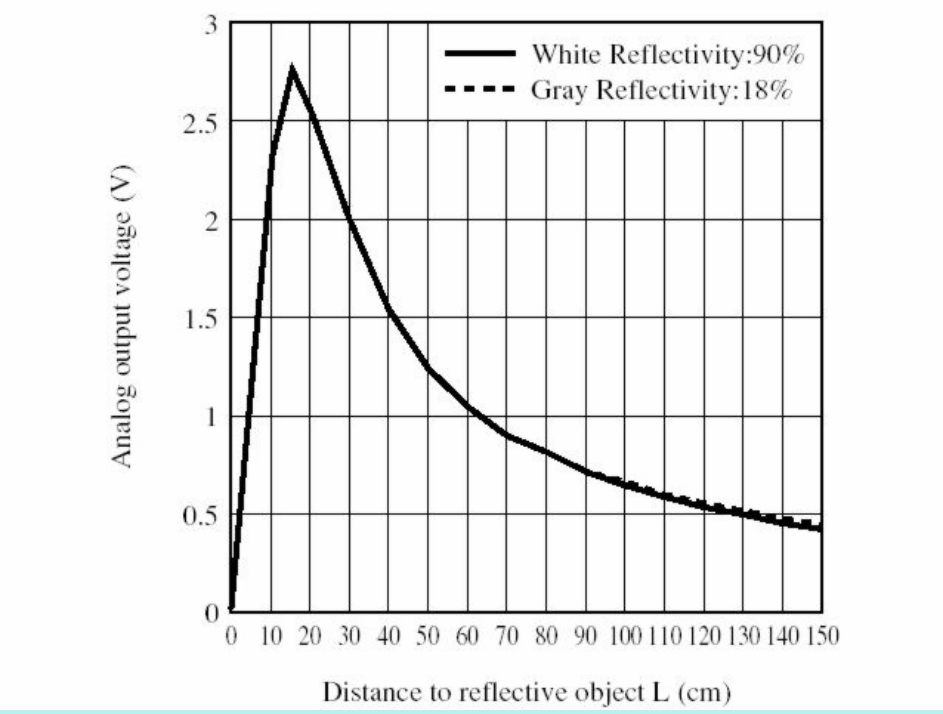
Medida de distancia

DISEÑO MICRORROBOTS

GP2D12/GP2Y0A02YK (Sharp)

Distancia medida vs **distancia real al objeto**



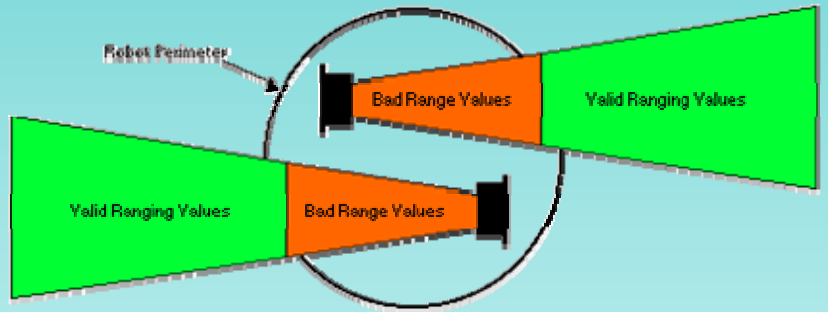


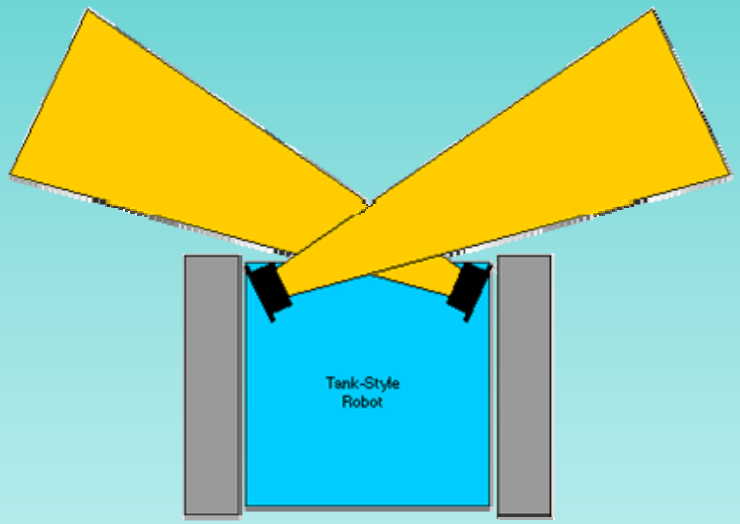
- Distancias entre 20cm y 150cm !!!!
- La medida de distancia se actualiza de manera continua cada 39ms !

Medida de distancia

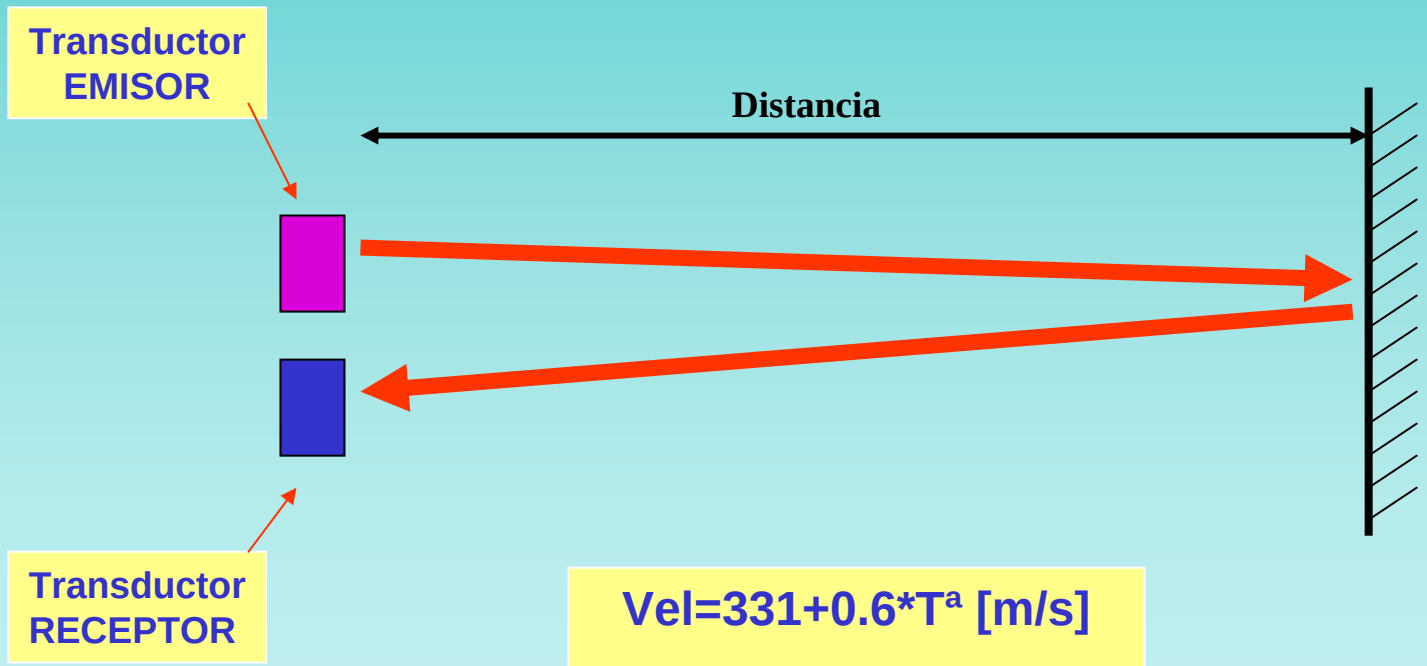
DISEÑO MICROROBOTS

GP2D12/GP2Y0A02YK (Sharp)





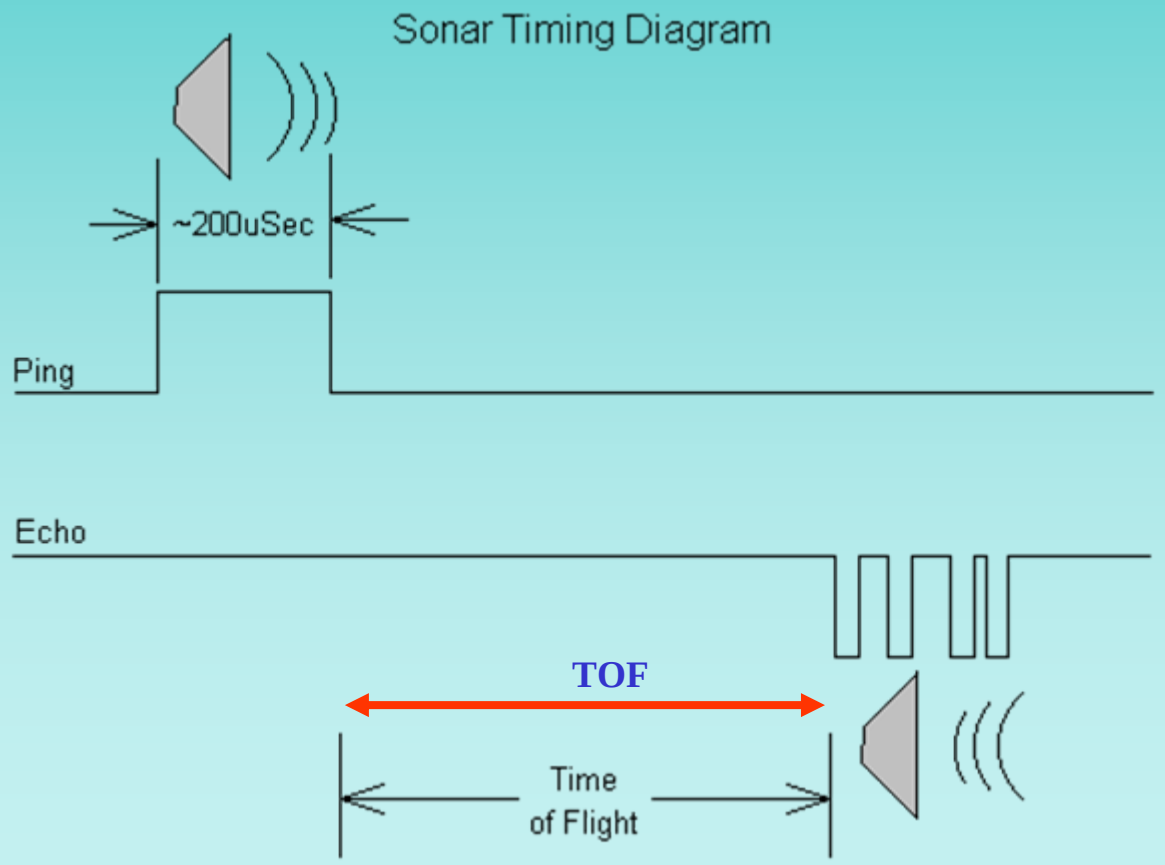
Medidores de distancia por ultrasonidos



$Vel=331+0.6*T^{a}$ [m/s]

Distancia=Vel*(t/2)

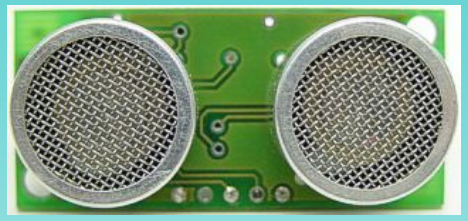
SENSORES: Medidores de distancia por ultrasonidos



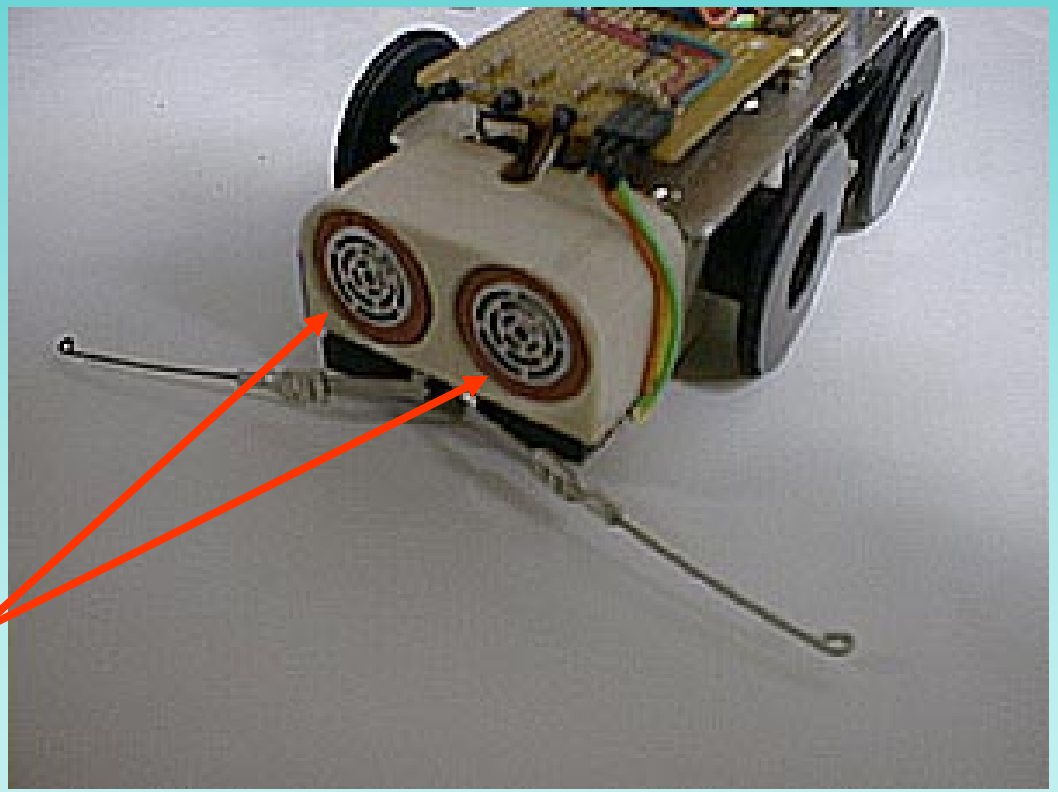
Medidores de distancia por ultrasonido

DISEÑO MICROROBOTS

SENSORES: Medidores de distancia por ultrasonidos

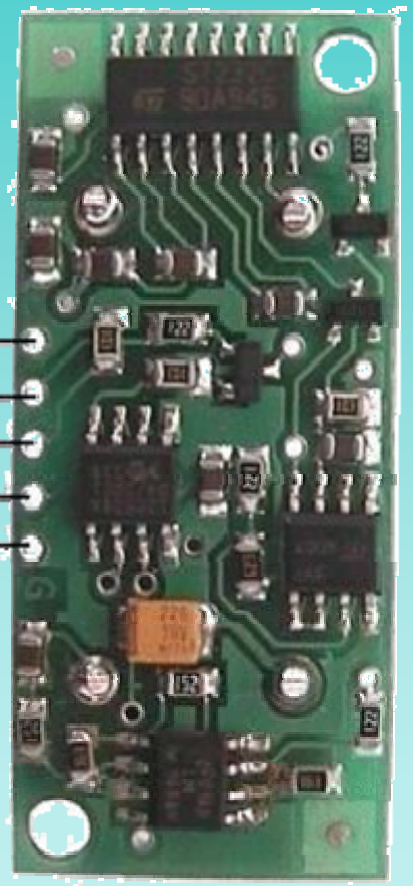


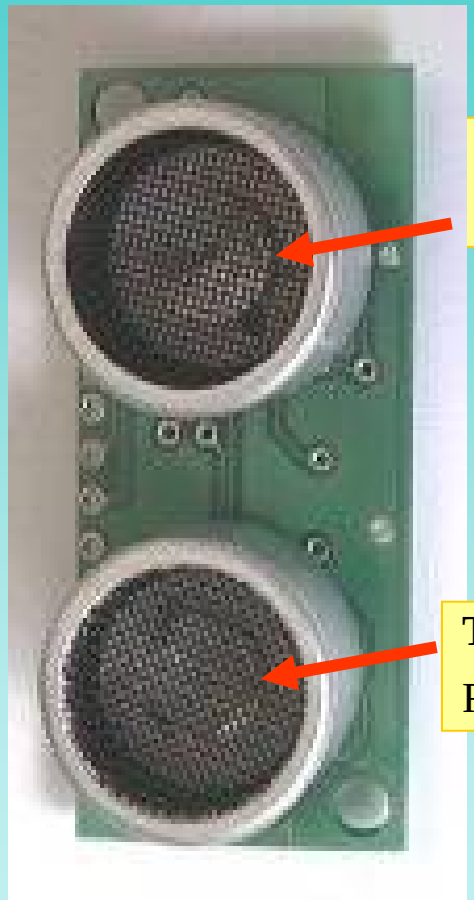
SRF04



Medidor de distancia por ultrasonidos : SRF04

DISEÑO MICRORROBOTS

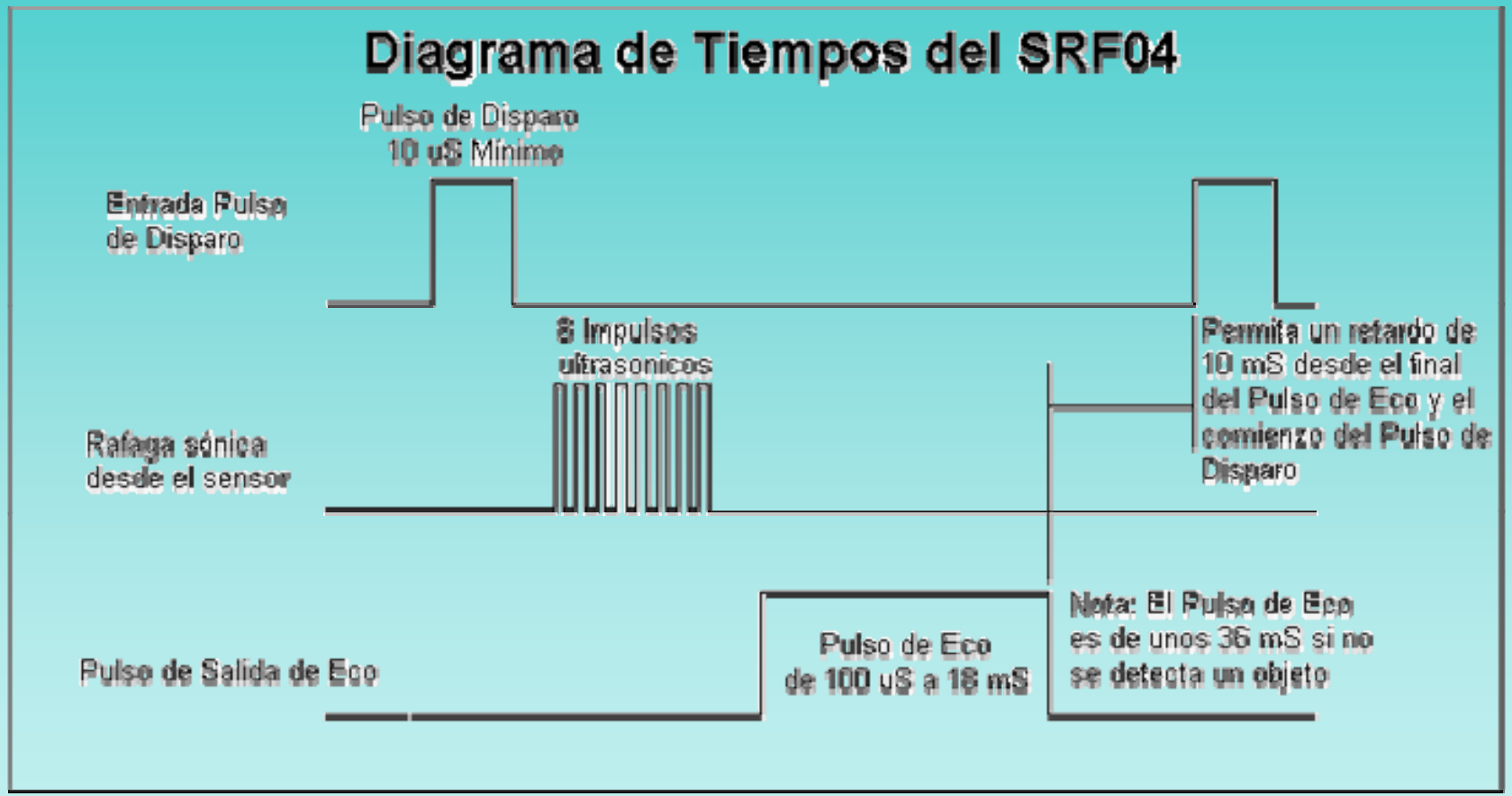




Mide de 30cm a 3m

Medidor de distancia por ultrasonidos : SRF04

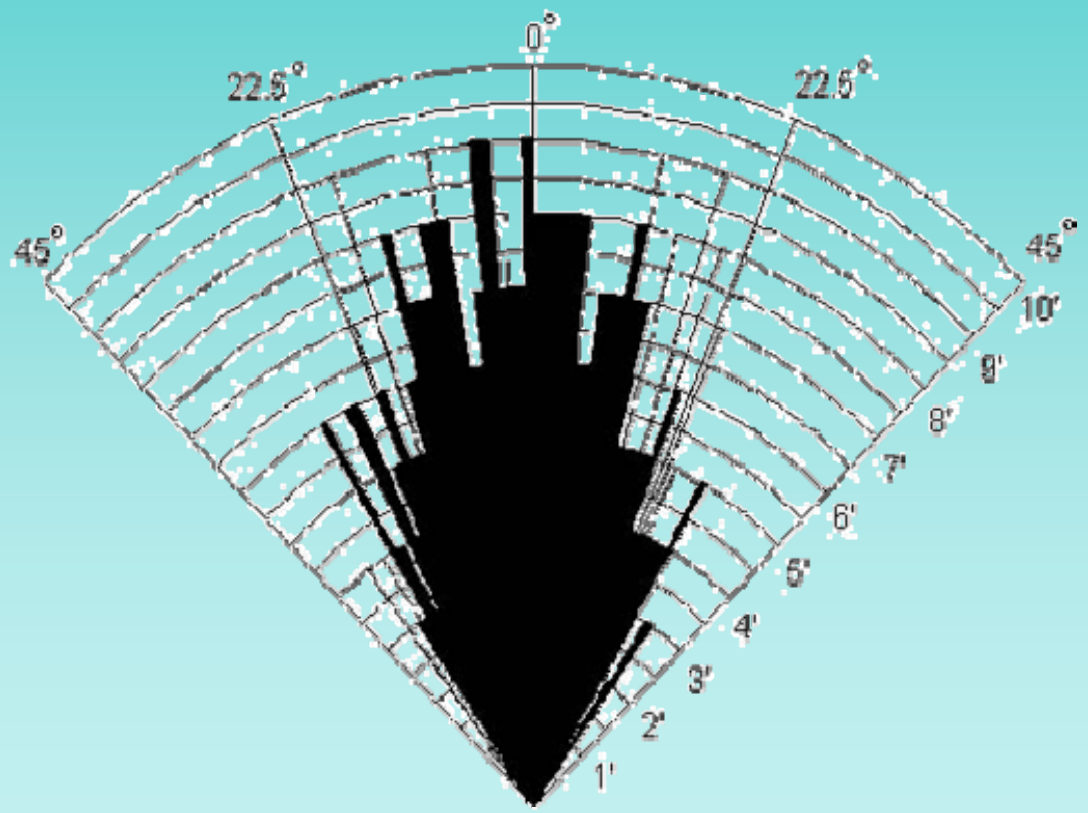
DISEÑO MICRORROBOTS



Medidor de distancia por ultrasonidos : SRF04

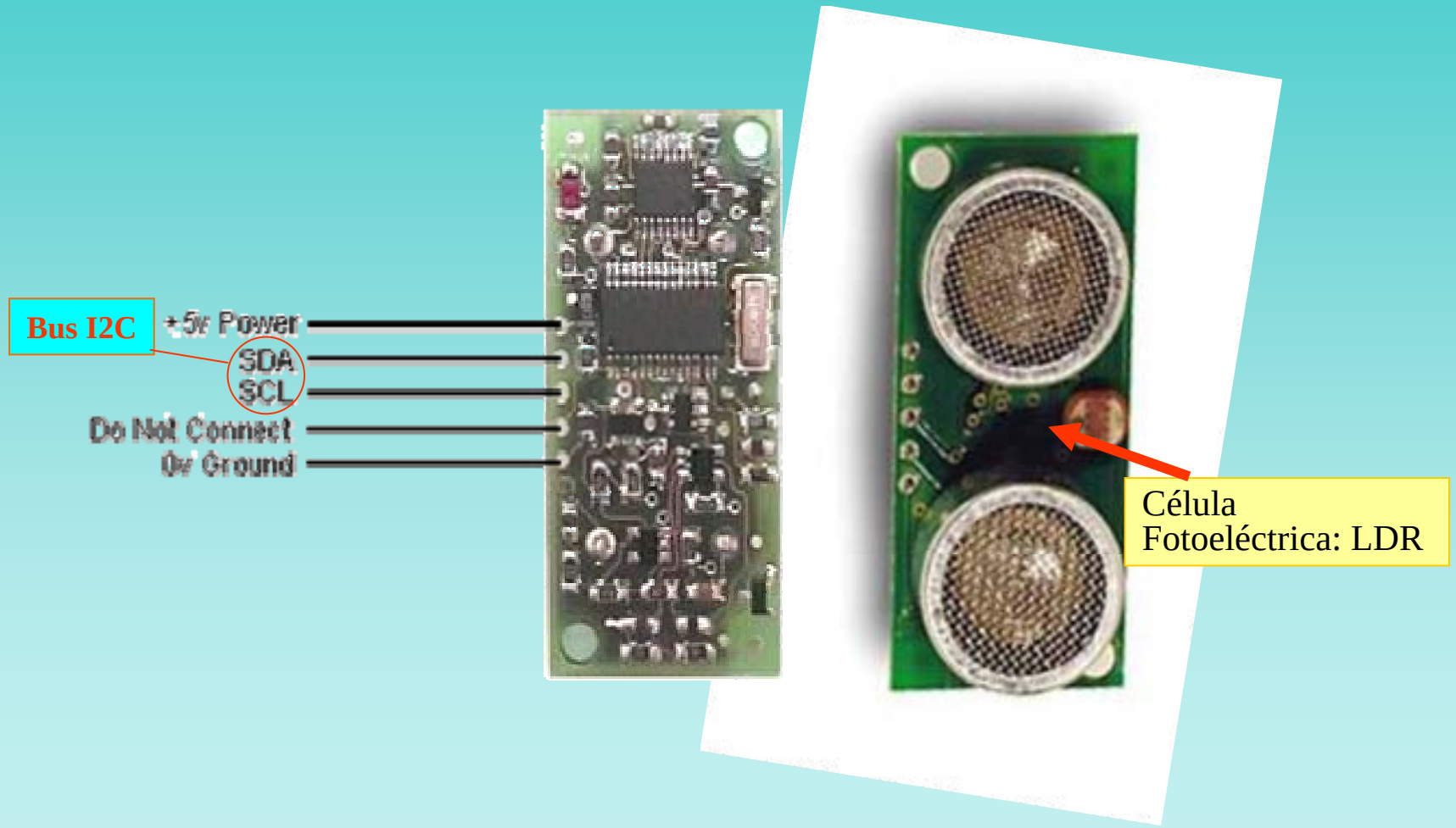
DISEÑO MICRORROBOTS

Patrón del haz recibido



Medidor de distancia por ultrasonidos : SRF08

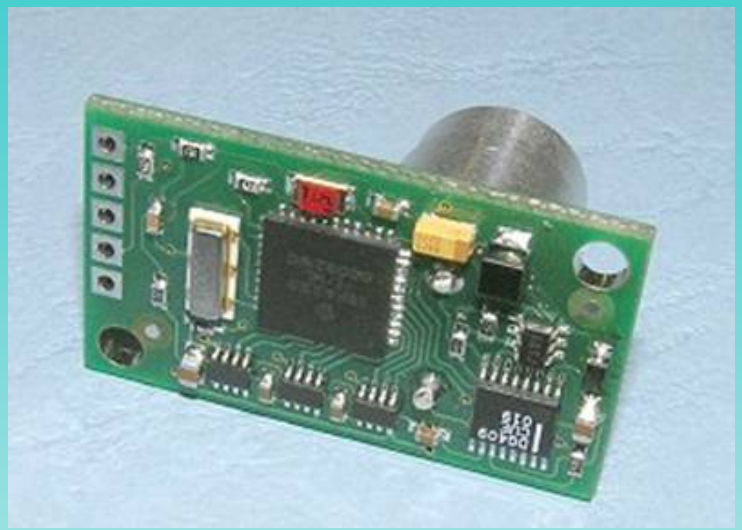
DISEÑO MICRORROBOTS



Permite configurar la ganancia de recepción y detectar múltiples ecos

Medidor de distancia por ultrasonidos : SRF235

DISEÑO MICRORROBOTS

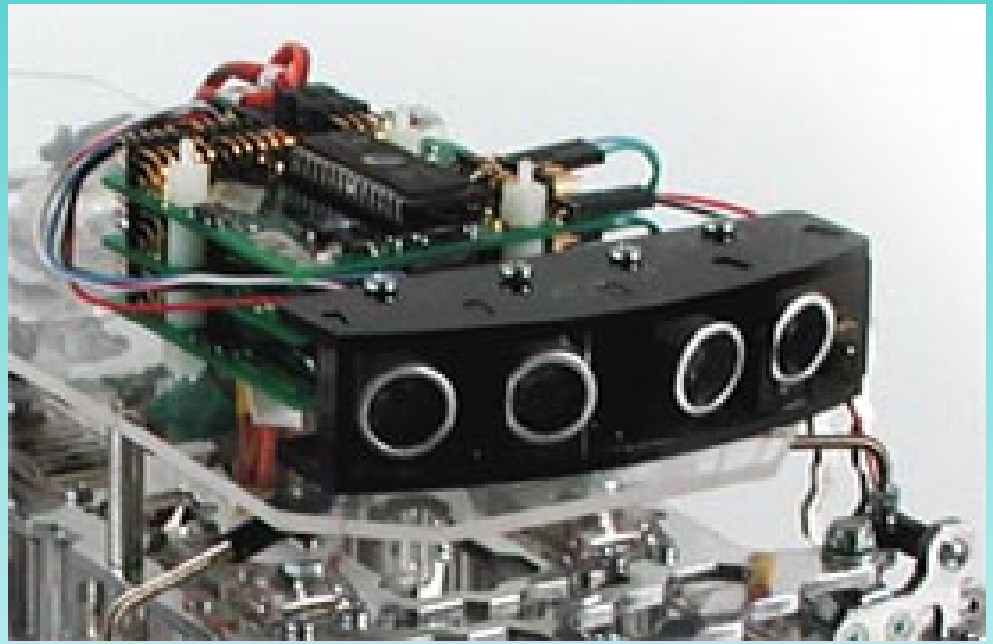


- Señal de ultrasonidos a 235KHz
- Rango: 10cm a 1,2m
- Haz de ultrasonidos estrecho
- I2C

Permite configurar la ganancia de recepción y detectar múltiples ecos

Medidor de distancia por ultrasonidos : SRF08

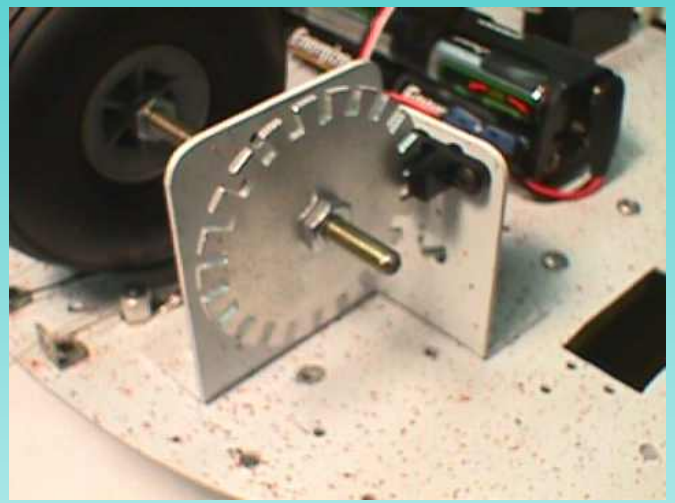
DISEÑO MICRORROBOTS

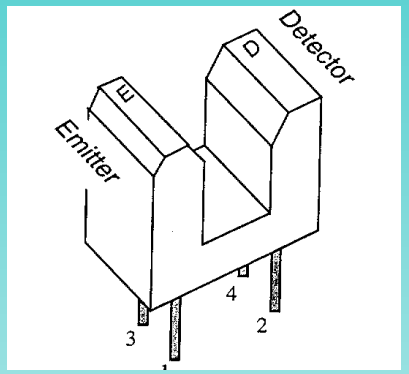


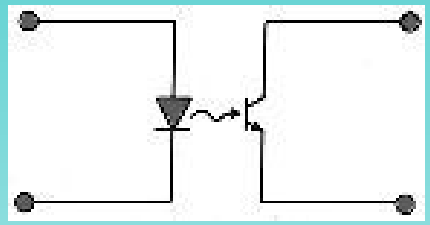
Detección del movimiento de las ruedas

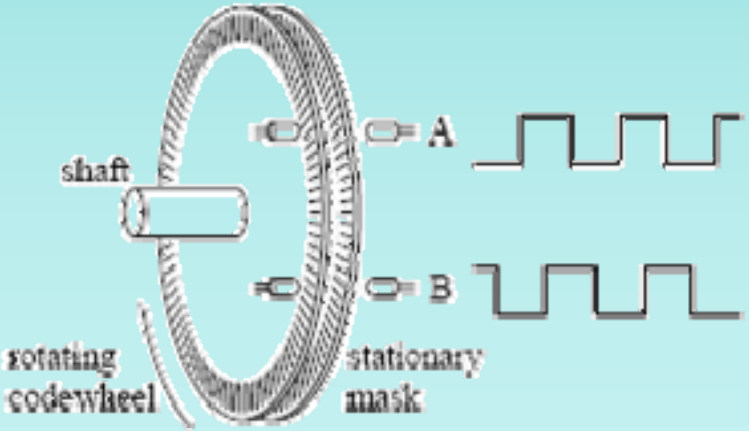
DISEÑO MICRORROBOTS

Encoders



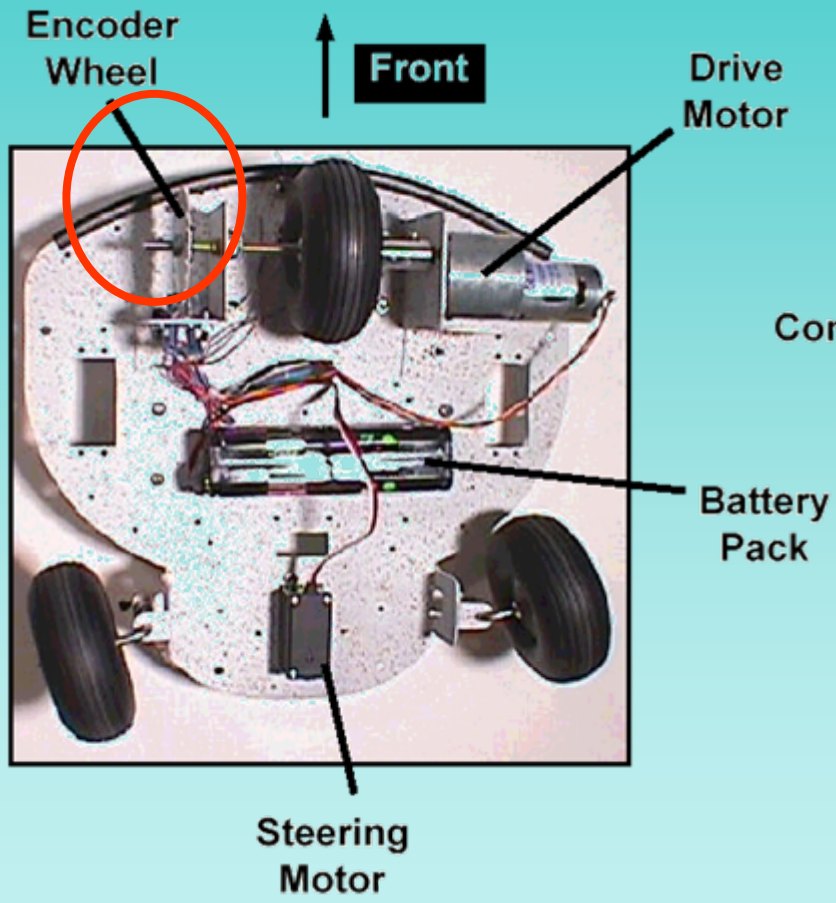


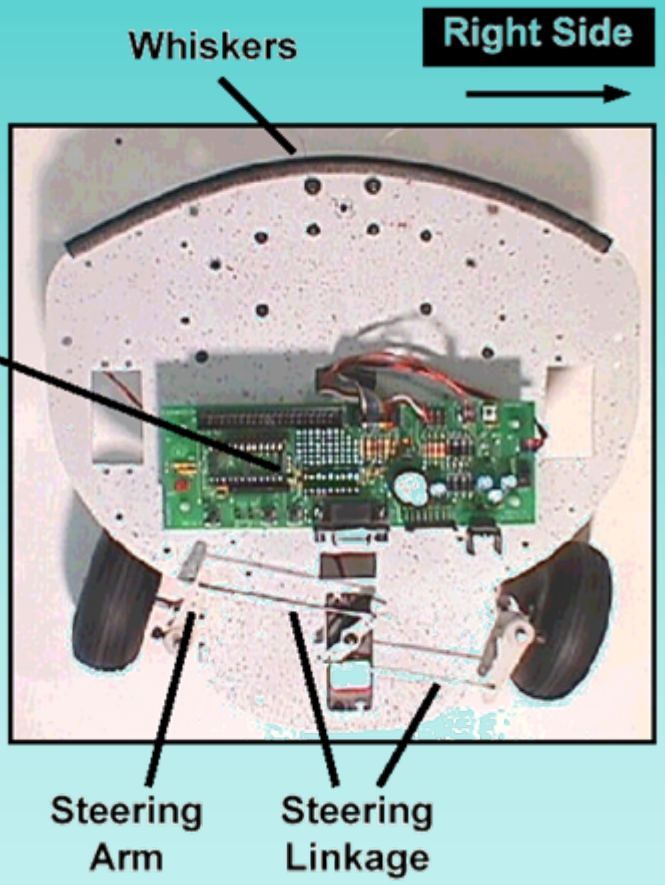




Encoders

DISEÑO MICROROBOTS

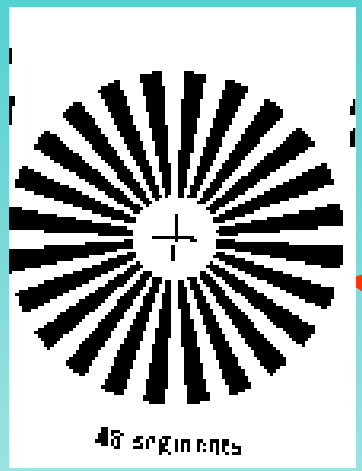




Componentes: sensores

DISEÑO MICRORROBOTS

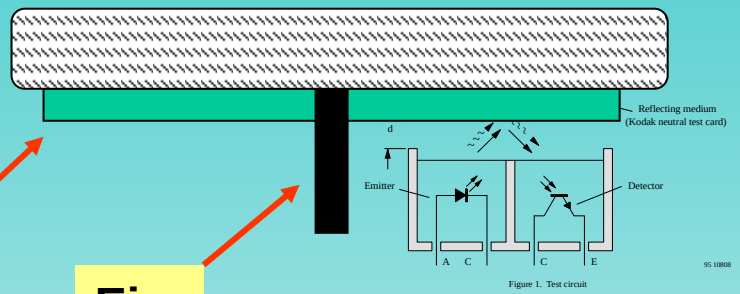
SENSORES: Encoders

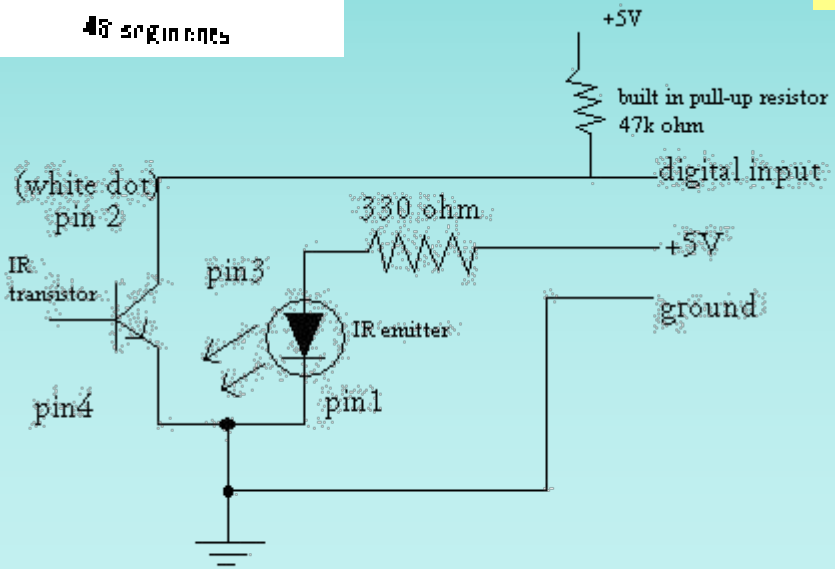


Rueda

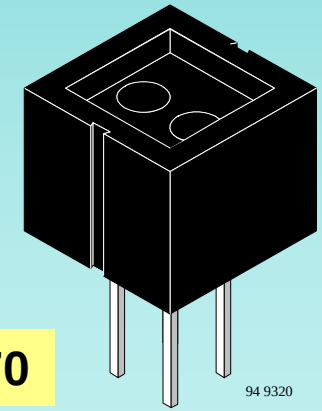
Disco

Eje





The diagram shows how to connect the slotted optical swtich to the Handy Board.



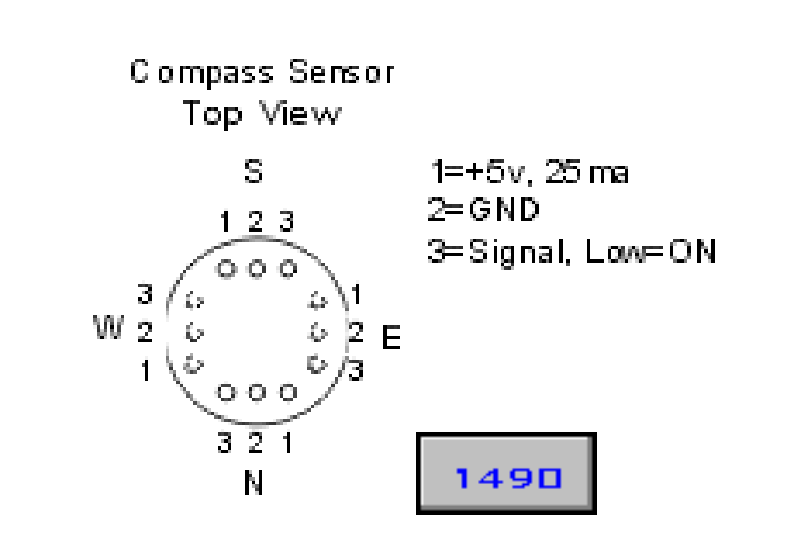
CNY70

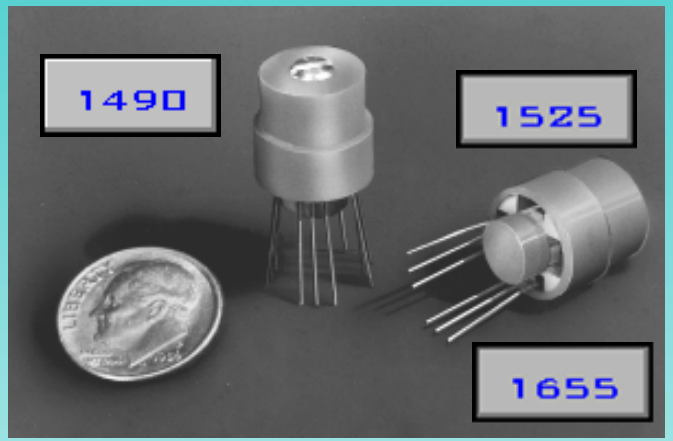
Compass

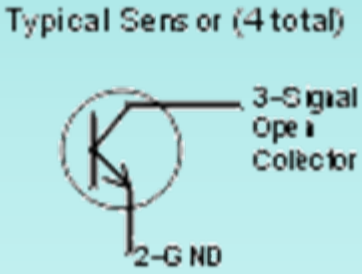
DISEÑO MICROROBOTS

DINSMORE INSTRUMENT CO.

http://dinsmoregroup.com/dico/index.htm

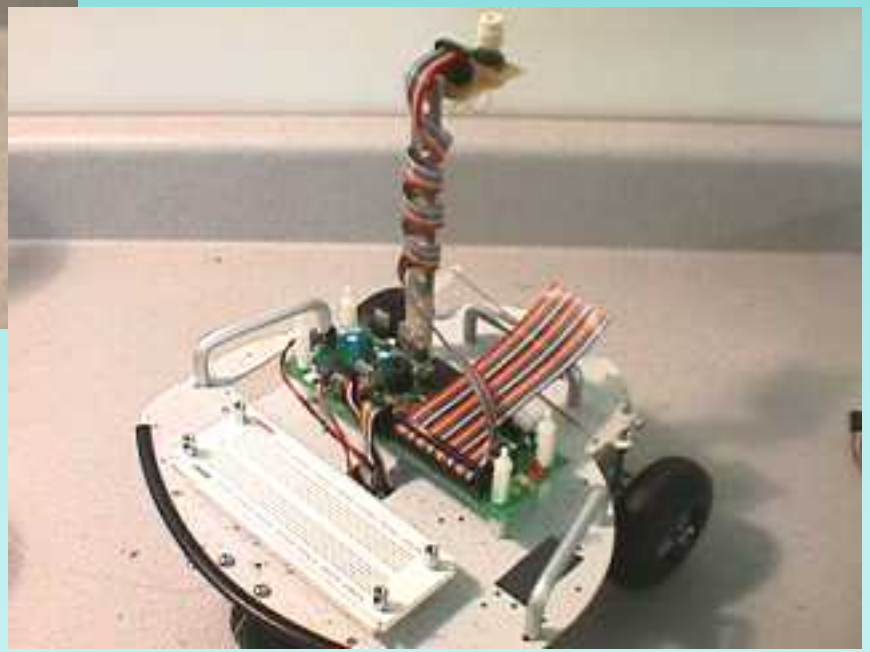






4 señales: N,S,E,W que combinadas, permiten orientarse a 8 puntos cardinales: N, NE, E, SE, S, SW, W,NW

Brújulas

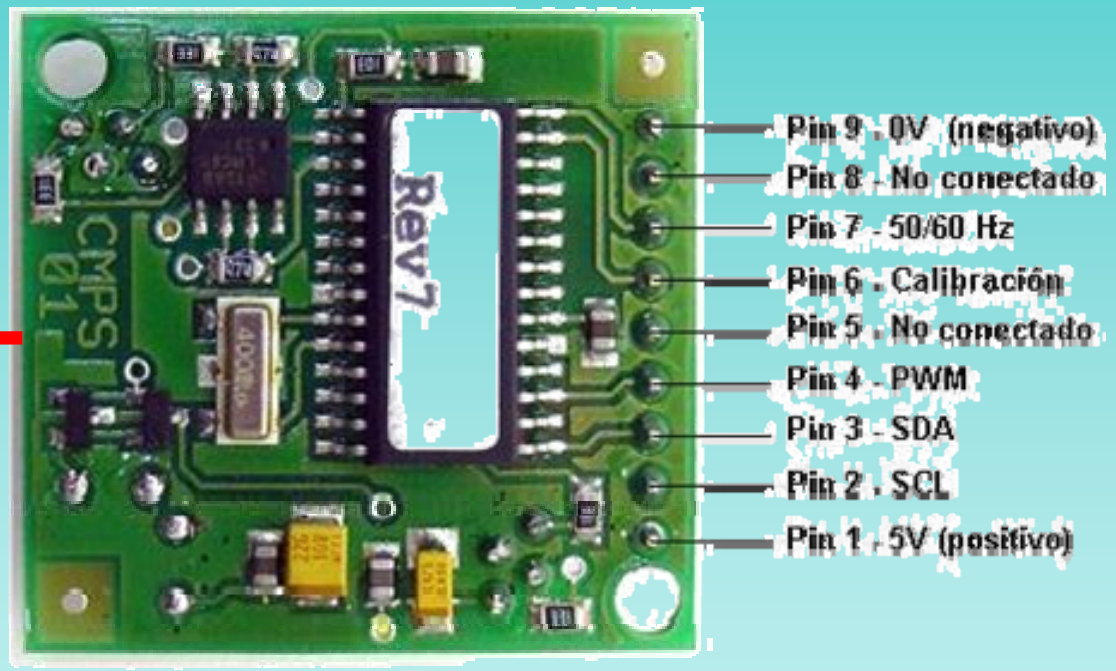


Brújula Digital CMPS03

DISEÑO MICRORROBOTS

- Alimentación: 5V
- Resolución: 1º (Max. = 0.1º)
- Interfaz CPU: 2 hilos (I2C)
  1 hilo (PWM)

NORTE



Pin 4: salida PWM

Pulso 1ms (0º) a 36,99ms (359,9º)

Periodo: 65,536ms (contador 16 bits)

SuperRobotica.com

Referencias

DISEÑO MICRORROBOTS

Sitios donde encontrar información de sensores

- Superrobotica

  www.superrobotica.com

- Acroname

  www.acroname.com

- Robot Store

  www.robotstorehk.com

- X-Robotics

  www.x-robotics.com

- “Sistema de desarrollo basado en el sensor de ultrasonidos SRF08 y en la brújula digital CMPS03”. D. David González Regueiro. Trabajo Fin de Carrera de la Escuela Politécnica Superior. Universidad de Alcalá. Diciembre 2004.