Digital / Analog Sensing

IN

\[ 0V = \text{logic 0} \quad \text{or} \quad 5V = \text{logic 1} \]

From 0V to 5V, this represents an 8-bit resolution byte representation.

Contact / Bump Sensing

IN

\[ \text{range } 0V-5V \rightarrow 0 - 255 \]

Bump Switch (tactile sensor)

\[ \text{Open} = 5V \quad \text{closed} = 0V \]
Light Sensor (Cds Photocell)

\[ 5V \]
\[ 47k\Omega \]
\[ \sim 0.3V \sim 4.6V \]
\[ \sim 3k\Omega \sim 500k\Omega \]

Cadmium Sulfide (Cds)

spectral response ∼ human eye
Reflective Photo sensor

5V

330Ω

IR LED

5V

47kΩ

IN

IR Photo transistor

wall
(reflectivity is color dependent)

~5V → 0V

*** Related Device

Opto-isolator

+5V

+5V

IN

OUT
Sharp IR Range Finder

Position-sensitive detector

GP2D120 $\rightarrow$ 1.5'' - 12''
GP2D12 $\rightarrow$ 4'' - 30''
current $\sim$ 30 mA
6-1 GP2D120 Example of Output distance characteristics

- White paper (Reflectance ratio 90%)
- Gray paper (Reflectance ratio 10%)

Analog voltage output (V)

Distance to reflective object (cm)
Sonar (Devantec Range Finder)

\( \text{40 kHz sonic burst} \)
\( \text{"chirp"} \)
\( \text{SRF04 \rightarrow range 3" - 10ft.} \)
\( \text{current \sim 30mA} \)

Beam Pattern

![Beam Pattern Diagram]

SRF04 Timing Diagram

- Trigger Input To Module
- Sonic Burst From Module
- Echo Pulse Output To User Timing Circuit

### SRF04 Timing Details

- **Trigger Pulse**
  - Minimum duration: 10µS

- **Sonic Burst**
  - 8 Cycle

- **Echo Pulse**
  - Duration: 100µS to 18mS
  - Note: Echo Pulse is approx. 36mS if no Object Detected

- Allow 10mS from End of Echo To Next Trigger Pulse
Devantec Compass

CMPS03 ~ 20 mA

Magnetic field sensors → Philips KMZ51 sensitive enough to measure Earth magnetic field

\[
\begin{array}{c}
\uparrow \\
S \\
\longrightarrow \\
N \\
\end{array}
\quad \text{horizontal component when } \parallel \text{ to ground}
\]

⇒ PWM Output (Pulse Width Modulation)

\[
T = \begin{array}{c}
66 \text{ms} - \sim 120 \text{ms} \\
\end{array}
\]

\[0° - 359.9°\]
Snap Switches (Contact Sensor)

Visible Light Sensors (CdS Photocells)
Reflective Photosensor

**FEATURES**
- Phototransistor Output
- No contact surface sensing
- Unfocused for sensing diffused surfaces
- Compact Package
- Daylight filter on sensor

Opto-isolator

Modulated IR sensor (IS471F)
Sharp IR Range Finder (GP2D120)

Sonar (SRF04)
Devantec Compass (CMP03)

CMPS03

Yaw-Rate Gyroscope (MLX90609)