Digital / Analog Sensing

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

8-bit resolution byte representation

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

Contact / Bump Sensing

\[\text{IN} \quad \text{5V} \quad 47\,\text{k}\,\Omega \quad \text{Bump Switch (tactile sensor)}\]

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

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

Cadmium Sulfide (Cds)

spectral response \sim human eye
Reflective Photo sensor

IN

IR LED

330 Ω

5V

IN

IR Phototransistor

47k Ω

Wall (reflectivity is color dependent)

~5V → 0V

*** Related Device

Opto-isolator

+5V

IN

OUT

+5V
Sharp IR Range Finder

Position-sensitive detector

GP2D120 → 1.5" - 12"
GP2D12 → 4" - 30"

Intensity

emitter
detector
PSD
linear CCD

Intensity

lens

\( \theta_x \)

\( \theta_y \)

current \( \sim 30 \text{ mA} \)
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)

40 kHz sonic burst
"chirp"

SRF04 $\Rightarrow$ range 3" - 10 ft.
current $\sim$ 30 mA

Beam Pattern

SRF04 Timing Diagram

- Trigger Pulse: 10uS Min
- 8 Cycle Sonic Burst
- Allow 10mS from end of echo to next trigger pulse
- Note: Echo pulse is approx. 36mS if no object detected

Echo Pulse Output To User Timing Circuit

Sonic Burst From Module

Trigger Input To Module
Devantec Compass

CMPS03 ~ 20 mA

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

horizontal component when || to ground

⇒ PWM Output (Pulse Width Modulation)

= 1.3699 ms → 65 ms
represents 0° - 359.9°

T = 66 ms ≈ 120 ms
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

Micro Piezo Gyro (PG2033)