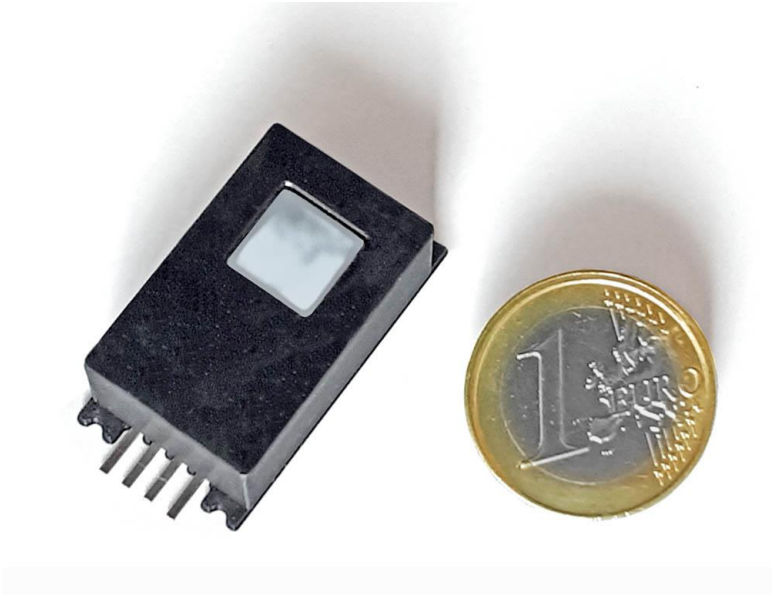


Alpha Sensor AL54

- **Detects alpha particles, electrons and photons**
- **Detects decay products of radon**
- **Works in daylight (no darkroom conditions required)**

Features and benefits
The analog signal output of the AL54 makes it the first choice for dedicated researchers and physics students alike.

Fields of application
- Instruments for the detection of radioactivity in the medical environment
- Radiation monitors for nuclear surveillance and safety
- Detection of illegal substances
- Radon experiments
- Scientific courses and practical laboratory experiments

Description of the sensor

The heart of the AL54 radiation sensor is a custom PIN diode covered with a thin aluminum foil to make it insensitive to light. Electrons (beta) and photons (gamma) easily penetrate the aluminum foil. Alpha particles which interact with the aluminum foil generate electrons and photons that can be detected by the PIN diode.

An integrated pulse discriminator with temperature compensated threshold provides a true TTL signal output for alpha particles, electrons and photons. The performance of the AL54 solid-state sensor combined with its extremely low power consumption makes it an excellent choice for physics lab experiments as well as cutting-edge designs.

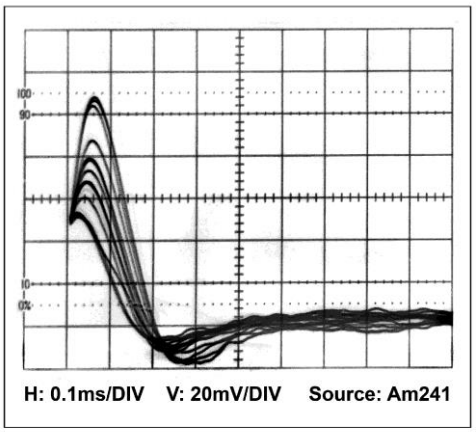
Absolute maximum ratings

Supply voltage, V_{CC} to GND	18.0 V
Output short-circuit current	continuous
Storage temperature range	-65 °C to 100 °C

Electrical characteristics

Unless otherwise indicated specified at:
V_{CC} = 5.0 V, T_A = 25 °C

Measurement range of dose rate	0.1 µSv/h to 100 mSv/h
Pulse Rate vs. Radiation Rate	5 cpm ± 15% for 1 µSv/h
Energy response	70 keV to 10 MeV
Analog output signal	80mV typical for Am241
Analog output pulse width	100 µs typical for Am241
Digital output pulse level	Equal to supply voltage (positive going)
Digital output pulse width	50 µs to 200 µs (LOW→HIGH→LOW)
Supply voltage range	2.5 V to 10.0 V (5.0 V recommended)
Supply current, I_S	25 µA TYP
Operating temperature range	-30 °C to 60 °C

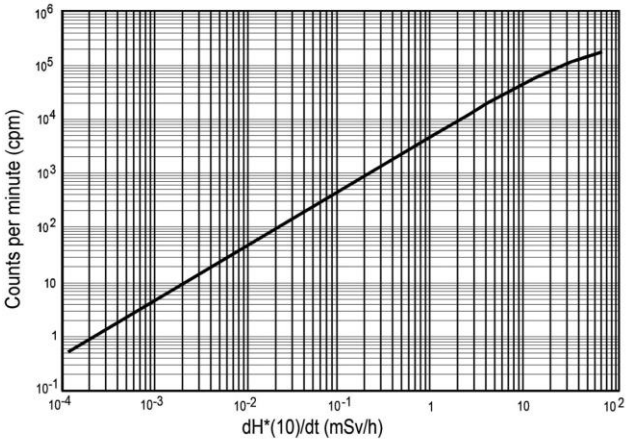


Typical analog output signal for Am241

Sensor characteristics

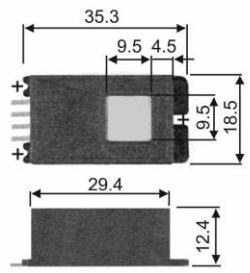
PIN diode active area	13 mm^2
Window	Aluminum 9.5 x 9.5 x 0.01 mm

AL54 sensor linearity



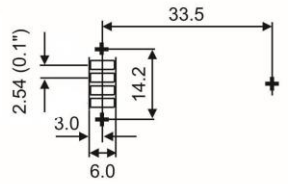
dH*(10) / dt = Radiation dose equivalent rate for Cs-137 and Co-60 (mSv/h)

AL54 outline dimensions



AL54 Outer Dimensions (in mm)

AL54 footprint



AL54 Mounting Instructions (in mm)

AL54 connecting description

View from bottom side

OUT-D Digital signal output
VCC Power supply
GND Power and signal ground
OUT-A Analog signal output

AL 54 Connecting Description

AL54 handling and soldering recommendations

- **CAUTION!** The window must not be touched or cleaned! A scratched or damaged window can impair the function of the PIN diode or even destroy it.

- **Preventing detection of undesired pulses**
  https://www.teviso.com/file/pdf/bg51-preventing-undesired-pulses.pdf

- **AL54 soldering recommendations**
  Hand soldering is recommended. Maximum temperature: 360°C, maximum duration: 5 seconds.

Detecting alpha particles with the AL54

What happens when alpha particles hit an aluminum foil?
When alpha particles hit an aluminum foil, they can undergo a variety of interactions, including

Elastic scattering: This is the most common type of interaction, where the alpha particle bounces off the aluminum core without losing energy. This is because the alpha particle is so much smaller than the aluminum nucleus that it does not have enough energy to penetrate the nucleus.

Inelastic scattering: This is a more energetic interaction in which the alpha particle gives up some of its energy to the aluminum nucleus. This can happen when the alpha particle transfers some of its energy to an electron in the aluminum atom, causing the electron to be ejected from the atom. The alpha particle can also lose energy by colliding with the nucleus itself.

It is important to know that the extent of these interactions depends on the energy of the alpha particles, the thickness of the aluminum foil and the angle at which the particles hit the foil. These interactions are often used in experiments and detectors to study alpha particles or to shield their radiation in various applications.

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