
# - Nuclear Radiation Sensor
# - Detects Beta and Gamma Radiation and X-Rays

## Description

The function of the RD2014 radiation sensor is based on an array of customized PIN diodes. The integrated pulse discriminator with a temperature compensated threshold level provides true TTL signal output. The RD2014 is capable of detecting beta radiation (electrons), gamma radiation (photons) and X-rays.

The performance of the RD2014 solid state sensor, in combination with high immunity to electrostatic fields make it a good choice for new state-of-the-art designs as well as for upgrading existing designs.

## Features and Benefits

- Detects beta and gamma radiation and X-rays
- New: Low power requirement (3.0V to 5.0V; 400µA)
- Detector sensitivity: 5.8 cpm/µSv/h
- High immunity to RF and electrostatic fields
- Linear response over wide temperature range (-30°C to 50°C)
- Swiss made

## Application Areas

- Equipment for detecting radioactivity in medical environment
- Radiation monitors for nuclear safeguards and security
- Gamma detector to detect illicit nuclear material
- Student projects

## Absolute Maximum Ratings

| | |
|---|---|
| Supply voltage, $V_{CC}$ | 6.0 V |
| Output short-circuit current | continuous |
| Storage temperature range | -65°C to 110°C |

## Electrical characteristics

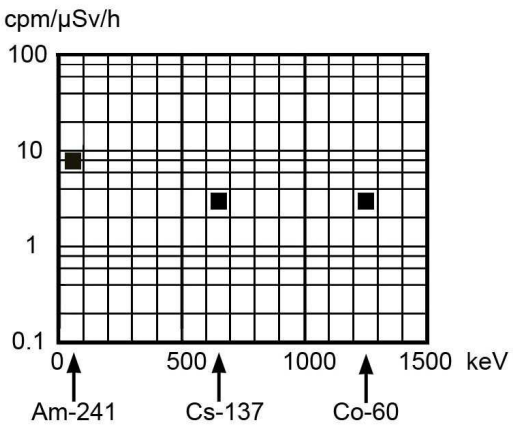
at $V_{CC}$ = 4.0V, $T_A$ = 25°C (unless otherwise noted)

| | |
|---|---|
| Measurement range of radiation dose equivalent rate (Cs-137 & Co-60) | 0.1 µSv/h to 100 mSv/h |
| Sensitivity | 5.8 cpm ± 15% for 1 µSv/h radiation dose rate |

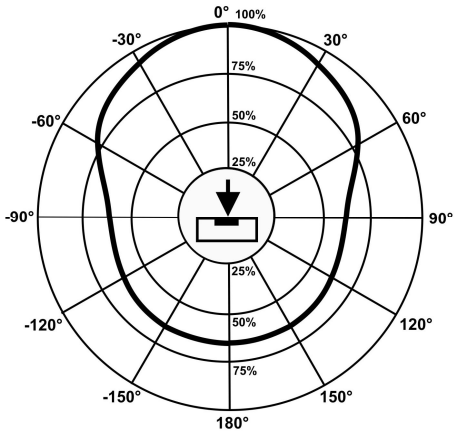
Energy response: 50 KeV to above 2 MeV

| | |
|---|---|
| Output pulse level | Equal to supply voltage (positive going) |
| Output pulse width | 40 µs to 150 µs |
| Supply voltage range, $V_{CC}$ | 3.0 V to 5.0 V |
| Supply current, $I_S$ | 400 µA TYP, 450 µA MAX |
| Linear temperature range | -30°C to 50°C |

### Typical Sensor Energy Response

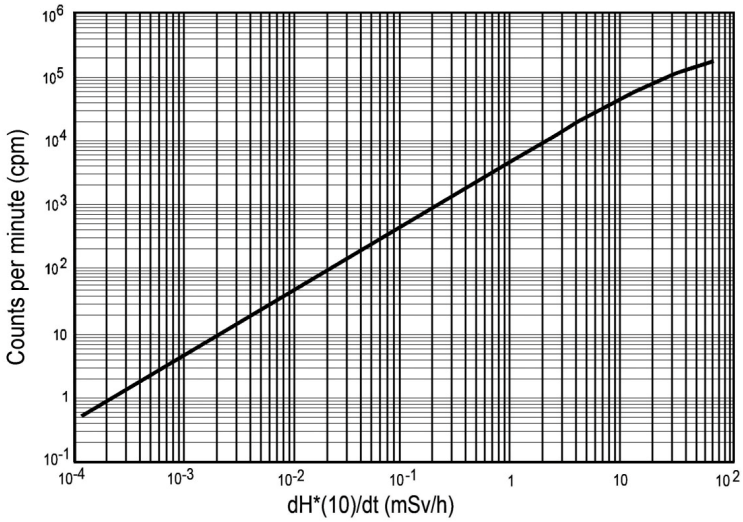



### Standard Sensitivity Response upon Gamma Radiation Incidence Angle with respect to the Calibration Direction



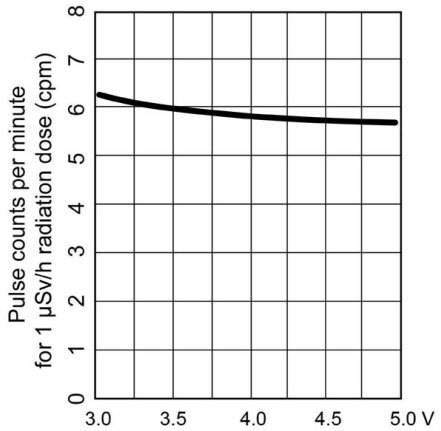

  

## RD2014 Sensor Linearity

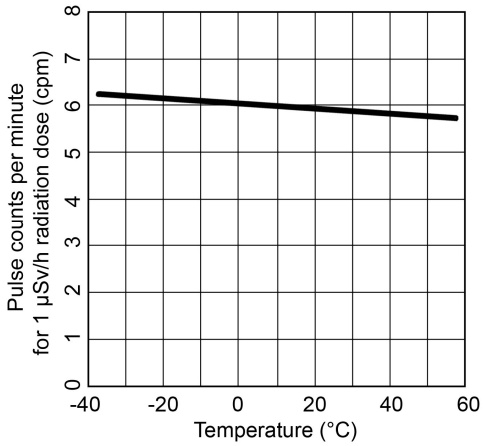



dH*(10) / dt = Radiation dose equivalent rate for Cs-137 and Co-60 (mSv/h)

## Typical Sensor Sensitivity vs. Supply Voltage

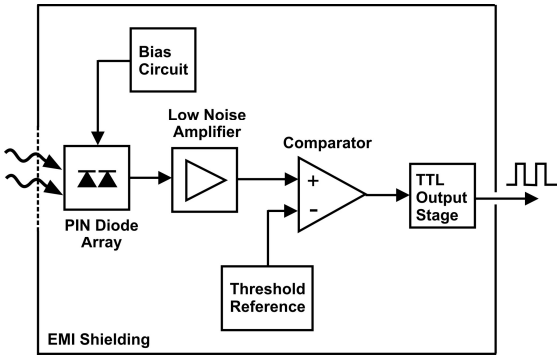



## RD2014 Typical Sensor Sensitivity vs. Temperature

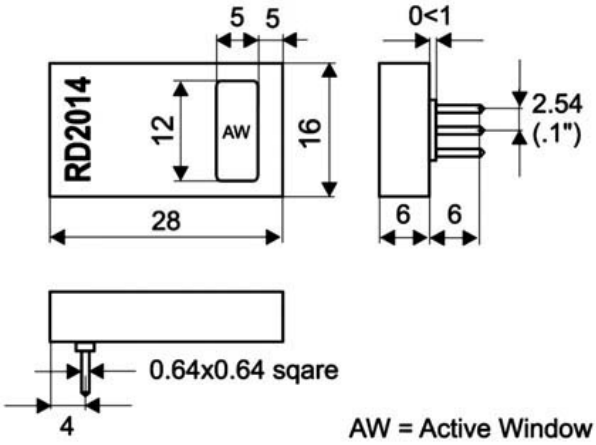


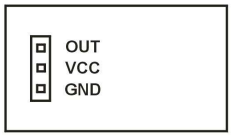
## RD2014 Functional Block Diagram




## Outline Dimensions (in millimeters)




## Connection Descriptions (View from connector side)




| | |
|---|---|
| OUT | TTL output signal |
| VCC | +3.0V to 5.0V power supply |
| GND | Power supply & output signal ground |

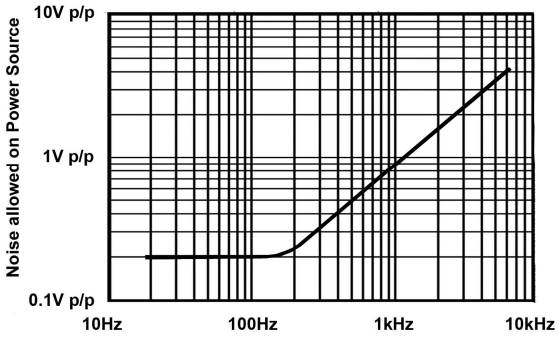
## Application Information

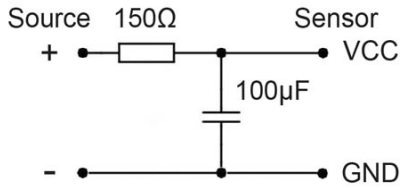
### Susceptibility to Strong Microwave Signals

In order to prevent generation of false output pulses by strong microwave signals
a) connect a 0.01µF capacitor as close as possible to the sensor between the pins GND and VCC
b) keep the sensor at least 30 cm (1 foot) away from microwave, cellular phone, etc.

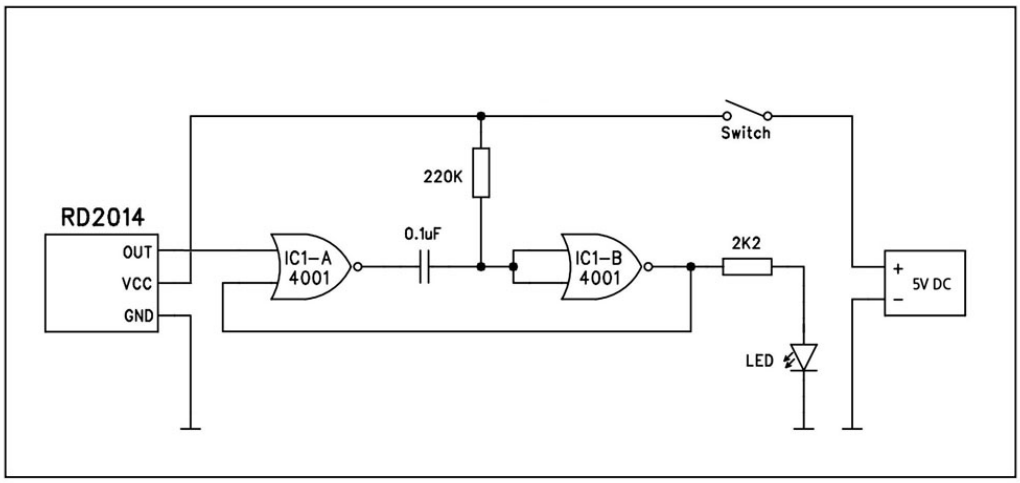
**Susceptibility to Noise on Power Source**
In situations where a high noise level on the power source could be a problem, an RC filter as shown below is recommended.




**Simple Nuclear Radiation Detector using the RD2014**

This simple battery-powered monitoring device with a LED diode indicates beta and gamma radiation, and X-rays. Output pulses from the RD2014 (40 µs to 150 µs) are converted into 10ms pulses (IC1-A & IC1-B) to provide a suitable drive for the LED. The LED can optionally be replaced by a headphone, a loudspeaker or a pulse counter. This circuit runs continuously for 8 months on three AA alkaline batteries.

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