



- **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; 400 $\mu$ A)
- Detector sensitivity: 5.8 cpm/ $\mu$ Sv/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  $V_{CC} = 4.0V$ ,  $T_A = 25^\circ C$  (unless otherwise noted)

Measurement range of radiation

dose equivalent rate (Cs-137 & Co-60) 0.1  $\mu Sv/h$  to 100 mSv/h

Sensitivity 5.8 cpm  $\pm$  15% for 1  $\mu Sv/h$  radiation dose rate

Energy response: 50 KeV to above 2 MeV

Output pulse level Equal to supply voltage (positive going)

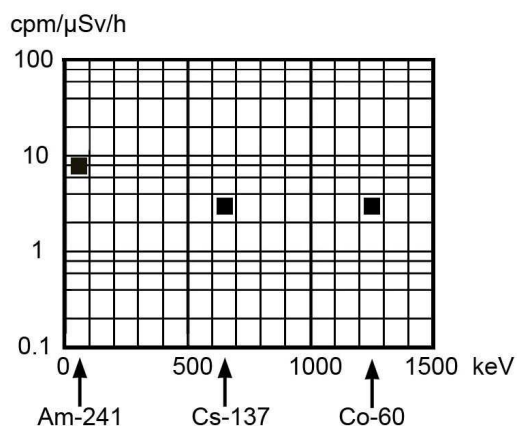
Output pulse width 40  $\mu s$  to 150  $\mu s$

Supply voltage range,  $V_{CC}$  3.0 V to 5.0 V

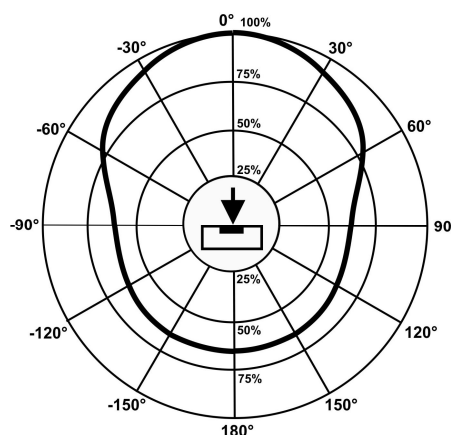
Supply current,  $I_S$  400  $\mu A$  TYP, 450  $\mu A$  MAX

Linear temperature range -30°C to 50°C

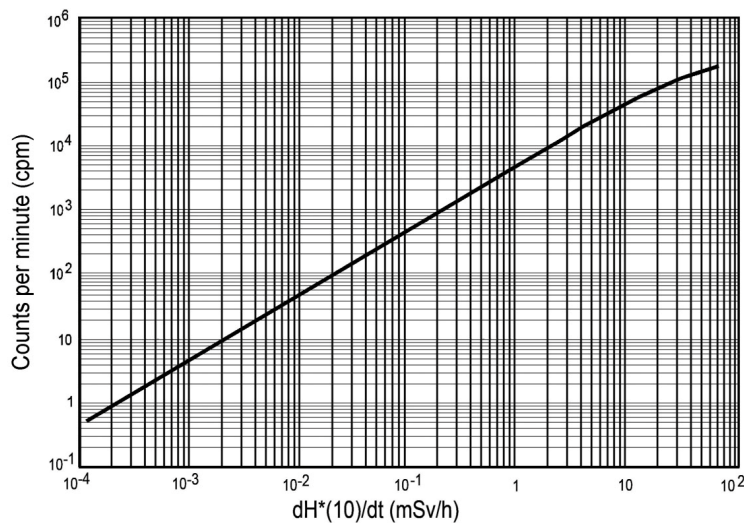
## Typical Sensor Energy Response



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

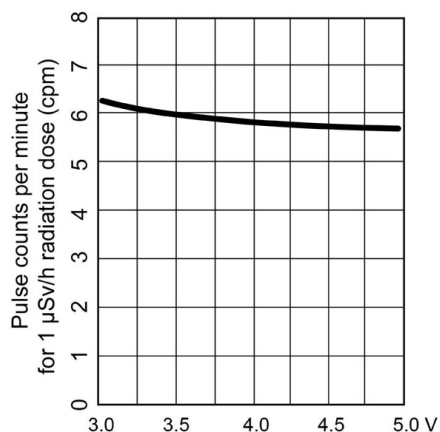


## RD2014 Sensor Linearity

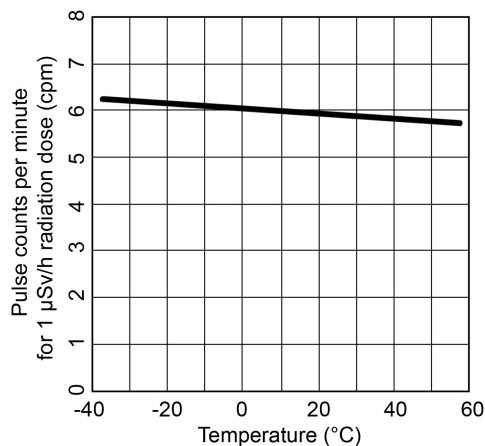


$dH^*(10) / dt$  = Radiation dose equivalent rate for Cs-137 and Co-60 (mSv/h)

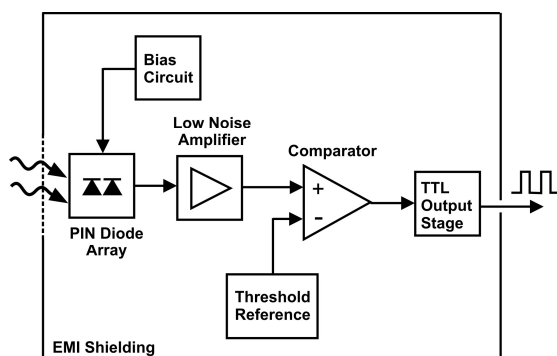
## Typical Sensor Sensitivity vs. Supply Voltage



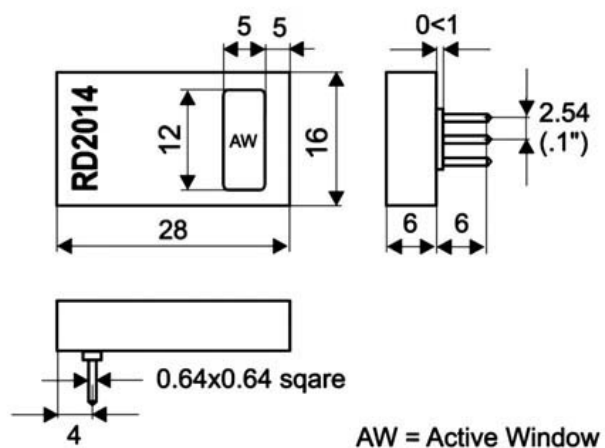
## RD2014 Typical Sensor Sensitivity vs. Temperature



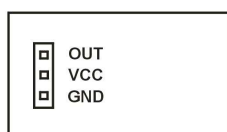
## RD2014 Functional Block Diagram



### 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

## Soldering Recommendations

Hand soldering is recommended. 360°C max., 5 seconds max.

## Application Information

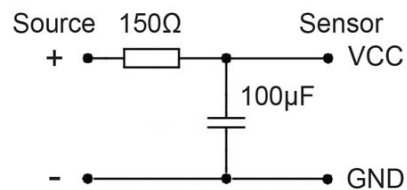
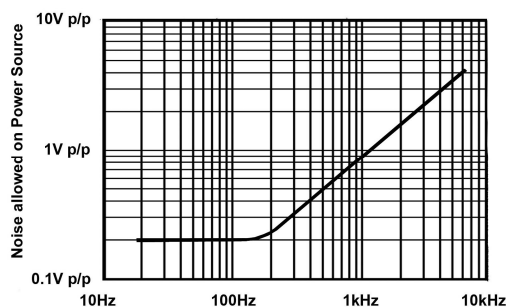
### Susceptibility to Strong Microwave Signals

In order to prevent generation of false output pulses by strong microwave signals

- connect a  $0.01\mu\text{F}$  capacitor as close as possible to the sensor between the pins GND and VCC
- keep the sensor at least 30 cm (1 foot) away from microwave, cellular phone, etc.

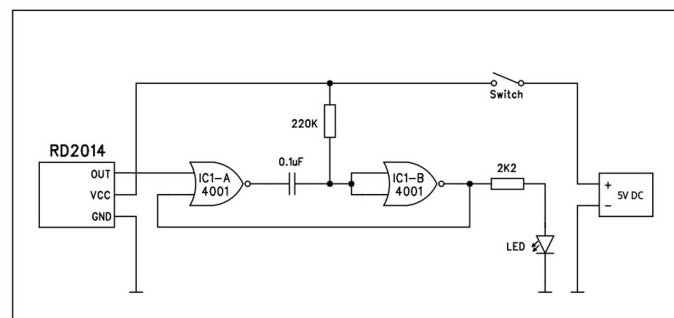
### Susceptibility to Noise on Power Source

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  $\mu\text{s}$  to 150  $\mu\text{s}$ ) 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.



### Disclaimer

Neither the whole nor any part of the information contained in, or the product described in this datasheet, may be adapted or reproduced in any material or electronic form without the prior written consent of the copyright holder.

This product and its documentation are supplied on an as is basis and no warranty as to their suitability for any particular purpose is either made or implied. Teviso Sensor Technologies will not accept any claim for damages howsoever arising as a result of use or failure of this product. Your statutory rights are not affected.

This product or any variant of it is not intended for use in any medical appliance, device or system in which the failure of the product might reasonably be expected to result in personal injury.

This document provides preliminary information that may be subject to change without notice.