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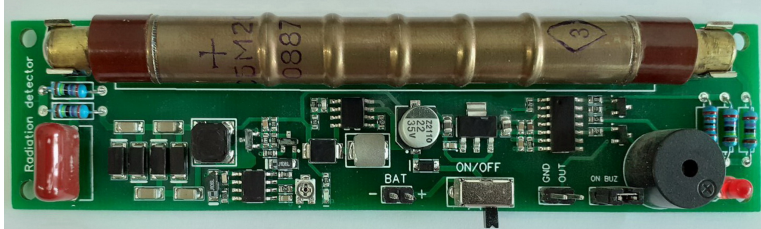
GGreg20_V3 Ionizing Radiation Detector

Description

The ionizing radiation detector GGreg20_V3 - a ready-to-use redesigned new generation device with Geiger tube SBM-20 and pulse counting output to the controller. Designed by IoT-devices in Kyiv, Ukraine.

Purpose

Radioactive particles detector - an electronic sensor module for building a personal ionizing radiation level counter. For this purpose, the detector includes an impulse counting output to a host controller. Arduino, Adafruit, ESP8266, ESP32, and others can be used as a host controller.

The radiation level is displayed by light and sound signals. Sounds can be muted by the user (jumper J1 - buzzer on/off).

GGreg20_V3 - a cheap and useful device for checking the "purity" of:
- mushrooms,
- berries,
- vegetables,
- firewood, etc.

This module is useful to build smart measurement devices for ionizing radiation power sensing in handheld / pocket design style or in stationary mode both for indoor or outdoor operation.
The only thing you need to start measuring the power of ionizing radiation with any GGreg20 module is any microcontroller that can count the number of pulses per unit of time on GPIO.

Specifications

1. Module dimensions - 30 x 126 x 12 mm. Weight 30 g.
2. Power supply:
   - from a rechargeable battery or a battery:
     i. 1 cell Li (3.7V) battery
     ii. 2 cell Ni (2.4V) battery
     iii. 3 cell (4.5V) battery connecting to port "Bat";
   - from a 5 Volt charger.
3. Power supply of the SBM-20 tube - built-in adjustable high voltage DC-DC converter. The target 400V voltage level is regulated by a potentiometer. The module is sold with fine-tuned parameters and ready for use.
4. Consumption current - 18 mA at 5V or 30 mA at 3.7V via LiIon.
5. GGreg20_v3 is compatible with logic signal levels (3V3 ACTIVE-LOW: 3 to 3.3V in HIGH state and about 0.7V in LOW state) of ESP8266 / ESP32, and will work even with a 5V logic input.
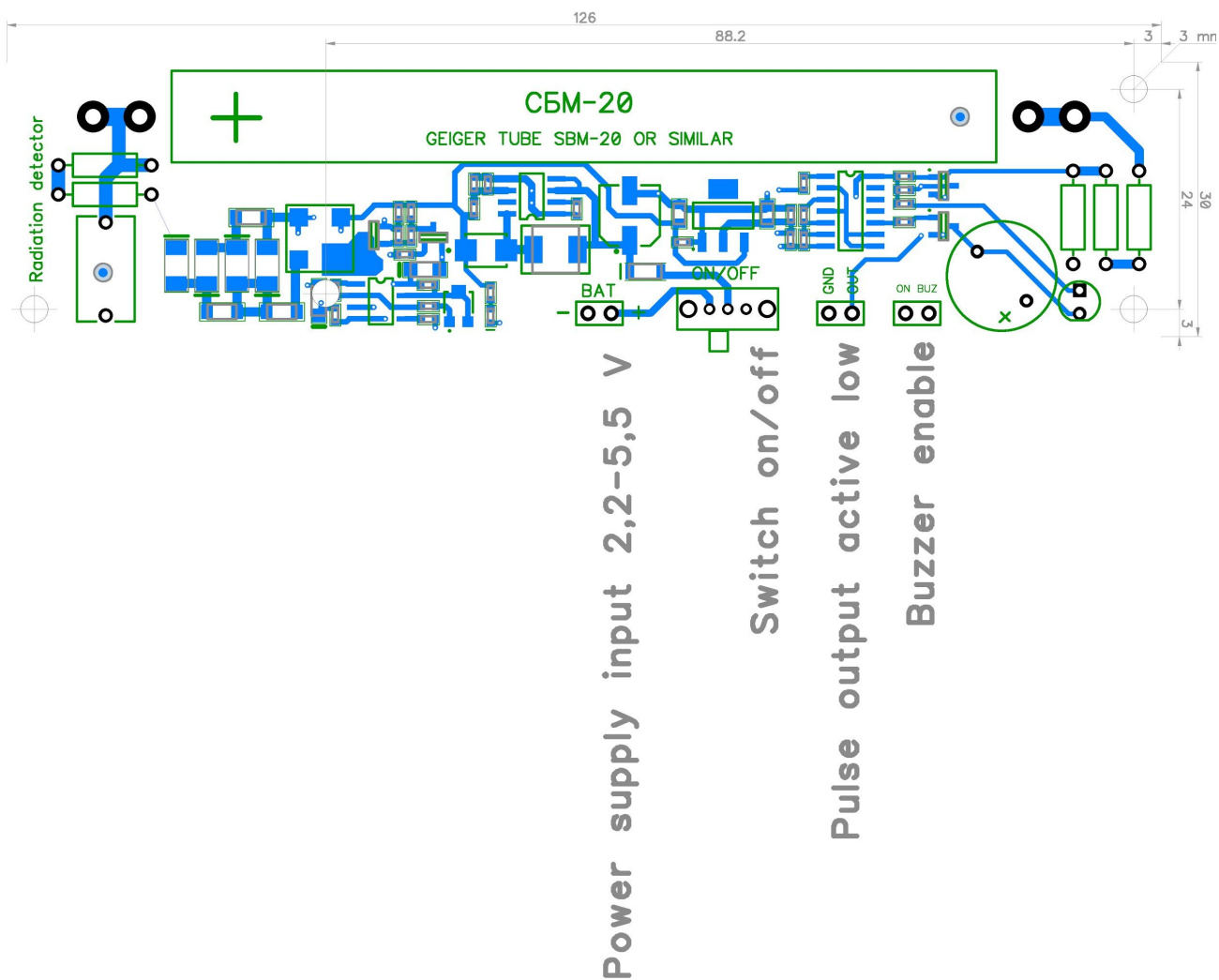
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Dimensions and Pin assignments

GGreg20_V3 module pin assignments are as follows:
- BAT - Power supply input 2.2V - 5.5 V;
- ON/OFF - Main switch on/off;
- OUT - Pulse output, active-low;
- BUZ - Buzzer enable jumper.

Sizes and dimensions of GGreg20_V3 module are as follows:
- X: 126 mm;
- Y: 30 mm;
- Z: 12 mm.

Differences and compatibility with the previous versions of GGreg20

Names of characteristics	GGreg20_V3 (NEW)	GGreg20_V1	Improvement status
Design	monomodular	two-module	Improved
Calculation formula	No change		
The design and size compatibility	Same, except placing the power switch		mostly unchanged
Stability of detection results during battery discharge	In the range of 2.4 - 5.5 volts (see [note 2])	Only at a supply voltage of 5 volts (uUSB input)	Improved
Measurement accuracy	20%	20%	no change
Power supply voltage range	2.2 - 5.5 volts (see [note 2])	3.7 - 5.5 volts	Improved
Current consumption	near 30 мА	near 30 мА	no change
Autonomous power supply	1 cell Li (3.7V) or 2 cell Ni (2.4V) or battery 3V or AC / DC adapter 2.4 - 5.5 V (see [note 2])	1 cell Li (3,7V) or 3 cell Ni (3,6V) or 3 cell battery (4,5V) or AC/DC (5V) adapter	Improved
User interfaces	LED, buzzer, Output connector	LED, buzzer, Output connector	no change
The complexity of integration in devices	Two connectors and one jumper (total 6 pin)	Three connectors and a jumper (11 pin in total)	Simplified
Protection against connection errors	Key connectors used and Schottky diode installed (see [note 2])	Not provided	Improved

[Note 1] GGreg20_V2 module version was not included in comparison because it was designed for other design solutions (and it does not provide space for SBM-20 tube on plate placement).

[Note 2] By default, the module board has a protection diode against false reversal when connecting the battery. This narrows the voltage range of the input power supply: 3 - 5.5 volts.

Switching-on and measurements

Connect the power input from the selected power source.

Turn on the power supply and in 10-15 seconds, you will hear the sound and see light signals when active particles enter the tube.

With a normal background level of radiation, the tube registers and generates 20-30 pulses per minute. The number of pulses can fluctuate depending on the weather or cosmic radiation. Consider the average number of signals per minute.

If you receive more than 60 signals per minute, be careful. Your detector has "felt" the effects of ionizing radiation emissions from the ambient environment or food, mushrooms, or wood, etc.

In short, the formula is simple: you need to accumulate the number of ingoing GPIO pulses per minute and then multiply by a factor. Like this:

microsieverts per hour = (impulses per minute) * 0.0092

where 0.0092 coefficient is obtained from the manufacturer's documentation on the tube.

Tubes may vary (+-20%), so we recommend using a conversion factor from 0.0054 to 0.0092 and calibrate your calculations against a trusted (certified) device.

Product kit sets:

GGreg20_V3 basic

1. GGreg20_V3 module --- 1 pc.
2. SBM-20 tube --- 1 pc.

Connectors (installed) and cables

3. GGreg20_V3 module --- 1 pc.

4. SBM-20 tube --- 1 pc.

5. Connectors JST XH 2P male straight --- 2 pcs.
   installed on the module board;

6. Pulse output cable 15 cm with connectors --- 1 pc:
   a. JST XH 2P female on one side and
   b. Dupont 2x1P female on the other side

7. Power supply input cable 15 cm with JST XH 2P female connector on one side --- 1 pc.