Self-oscillating temperature sensor based on a nanocomposite semiconductor material consists of a DC voltage source, a resistor, a capacitor, and an inductor. A resistive sensing element based on a nanocomposite semiconductor material, a second and third capacitors, a second, third, fourth, and fifth resistors, and a first and second bipolar transistors are included. The first terminal of the DC voltage source is connected to the first terminal of the first resistor; the second terminal of the inductor is connected to the first terminal of the second capacitor and the first terminal of the second resistor; and the second terminal of the second capacitor is connected to the output terminal. The base of the first bipolar transistor is connected to the first terminal of the third resistor, and the emitter of the first bipolar transistor is connected to the first terminal of the fourth resistor, as well as to the first terminal of the third capacitor. The second terminal of the third capacitor and the second terminal of the fourth resistor are connected to the emitter of the second bipolar transistor; the base of the second bipolar transistor is connected to the second terminal of the second resistor and the first terminal of the fifth resistor. The collector of the second bipolar transistor is connected to the second terminal of the fifth resistor, the second terminal of the resistive sensing element based on a nanocomposite semiconductor material, and the second terminal of the first capacitor. The first terminal of the resistive sensing element based on a nanocomposite semiconductor material is connected to the second terminals of the first and third resistors.