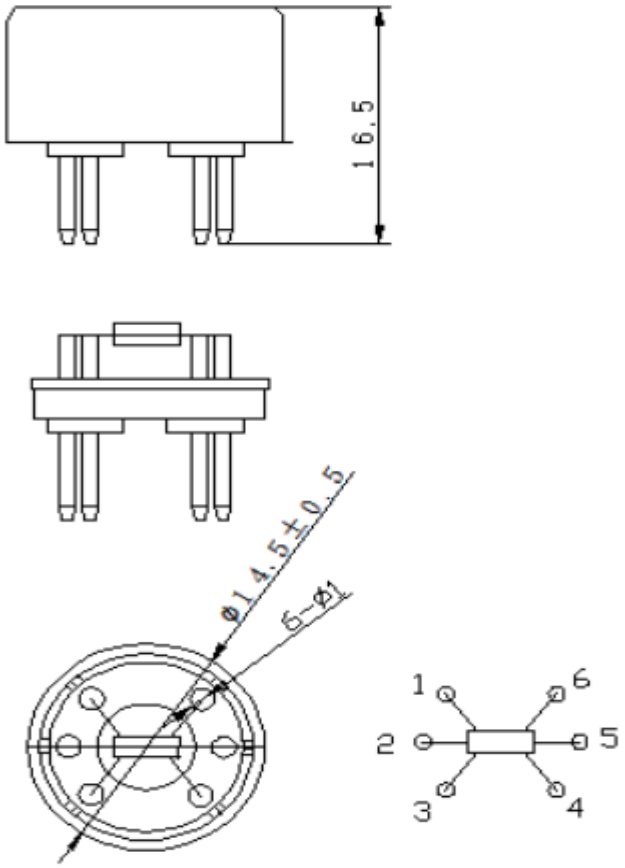
How Gas Sensor Works

The ability of a Gas sensor to detect gases depends on the **chemiresister** to conduct current. The most commonly used chemiresistor is Tin Dioxide (SnO2) which is an n-type semiconductor that has free electrons (also called as donor). Normally the atmosphere will contain more oxygen than combustible gases. The oxygen particles attract the free electrons present in SnO2 which pushes them to the surface of the SnO2. As there are **no free electrons** available output current will be zero.

When the sensor is placed in the toxic or combustible gases environment, the gas reacts with the adsorbed oxygen particles and breaks the chemical bond between oxygen and free electrons thus **releasing the free electrons**, which can can now conduct current. This conduction will be proportional the amount of free electrons available in SnO2.



A basic gas sensor has 6 terminals in which 4 terminals (1, 3, 4, 6) acts input or output and the remaining 2 terminals (2, 5) are for heating the coil. Of these 4 terminals, 2 terminals from each side can be used as either input or output (these terminals are reversible as shown in the circuit diagram) and vice versa.

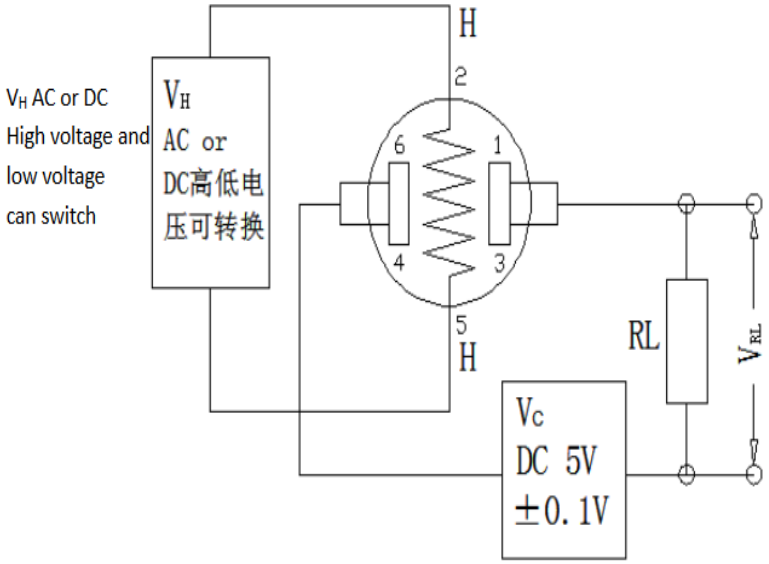
The gas sensor module basically consists of 4 terminals:

- **Vcc** – Power supply;
- **GND** – Power supply;
- **Digital output** – This pin gives an output either in logical high or logical low (0 or 1) that means it displays the presence of any toxic or combustible gases near the sensor;
- **Analog output** – This pin gives an output continuous in voltage which varies based on the concentration of gas that is applied to the gas sensor.

The purpose of the variable resistor is to adjust the output voltage and to maintain high sensitivity.

If no input voltage is applied to the heater coil, then the output current will be very less . When sufficient voltage is applied to the input terminal and heater coil, the sensing layer wakes up and is ready to sense any combustible gases nearby it.

Basic Circuit



Let’s assume that there is no toxic gas near the sensor, so the resistance of the layer doesn’t change and the output current and voltage are also unchanged and are negligible (approximately 0).

As the heater coil is pre-heated it is now easy to detect any combustible gases. When the sensing layer interacts with the gases, the resistance of the material varies and the current flowing through the circuit also varies. This change in variation can be then observed at the load resistance (RL).