

Operational amplifiers

Operational amplifiers (also called op-amps) are basically DC-coupled voltage amplifying devices designed to be used with components like capacitors and resistors.

Operational amplifiers were originally built for analogue computers and used to perform mathematical functions.

Today, they are efficient devices used in various applications, such as oscillators, filter circuits and many other applications.

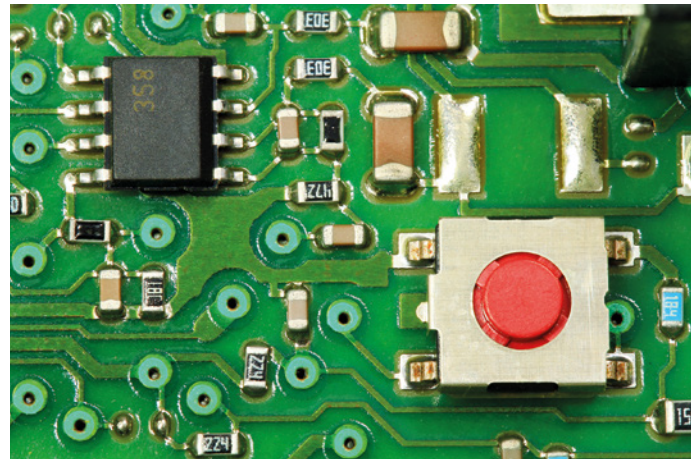
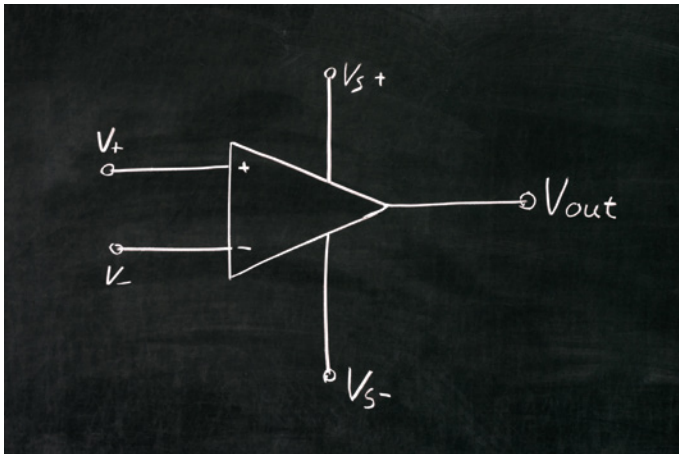
Operational amplifiers have two inputs:

- Non-inverting input: this input is marked by a '+' sign on the circuit diagram. It has been found that a positive voltage applied to the non-inverting input will produce a positive swing¹ at the output.
- Inverting input: this input is marked by a '-' sign on the circuit diagram. A positive voltage applied to the inverting input will produce a negative swing at the output.

If the same voltage is applied to both inputs together then there should be no change at the output. In fact the output is proportional to the difference between the inverting and non-inverting inputs. It is for this reason that these amplifiers are often called differential amplifiers.

GLOSSARY

- 1** oscillatory back and forth movement



ACTIVITIES

1 Read the text and underline the key words. Then answer the following questions.

- 1 What are operational amplifiers?
- 2 What are they used for?
- 3 How were they used originally?
- 4 What are their applications today?

2 Using the key words, describe the two main inputs of op-amps.

3 Complete the text with the words given. **transistors – emitter – circuit – input – amplification – cheap**

The 741 op-amp

The most common op-amp is the integrated **1** 741. This type of circuit was introduced by Fairchild in 1968 and, together with subsequent op-amps, has become the standard **2** device. Its **3** price has contributed to making it more and more common.

The standard 741 op-amp circuit contains 20 **4** and 11 resistors. It starts with a differential **5** stage, followed by an N-P-N voltage amplification stage with an active output. A P-N-P **6** follower drives a push-pull emitter follower output stage.