

Op-Amps

Operational amplifiers (op-amps) are represented as triangle-shaped components in schematics, significant in both analog and digital electronics.

A voltage divider is created with resistors to set a reference voltage, resulting in an output voltage that demonstrates the amplification factor.

The first golden rule of op-amps states that the output attempts to maintain zero voltage difference between its inputs, leading to specific calculations for gain.

Op-amps can amplify signals from sensors like PT100 temperature sensors or microphones; however, limitations arise when only positive AC voltages are amplified due to supply voltage constraints. To address these limitations, a DC offset can be added, yet this may lead to hitting output limits quickly due to the non-ideal characteristics of real op-amps.

An ideal op-amp would have infinite input impedance and zero output impedance; however, real-world op-amps do not meet these criteria but can still function effectively for many applications.

For microphone amplification, an inverting op-amp configuration is suggested where the non-inverting input is grounded while allowing complete AC signal amplification without DC interference.

Without feedback connections between outputs and inputs, the output will swing fully high or low based on which input has a higher voltage—this behavior defines a comparator setup.