

01.3 fun.src Sources

Sources (a.k.a. supplies) supply power to a circuit. There are two primary types: *voltage sources* and *current sources*.

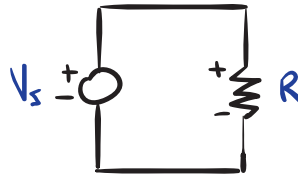
Ideal voltage sources

An ideal voltage source provides exactly the voltage a user specifies, independent of the circuit to which it is connected. All it must do in order to achieve this is to supply whatever current necessary. Let's unpack this with a simple example.

Example 01.3 fun.src-1

In the circuit shown, determine how much current and power the ideal voltage source V_s must provide in order to maintain voltage if $R \rightarrow \infty$ and if $R \rightarrow 0$.

re: limitations of a voltage source



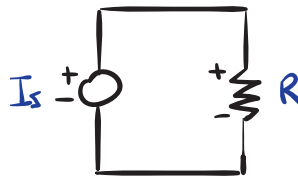
Ideal current sources

An ideal current source provides exactly the current a user specifies, independent of the circuit to which it is connected. All it must do in order to achieve this is to supply whatever voltage necessary. Let's unpack this with a simple example.

Example 01.3 fun.src-2

In the circuit shown, determine how much voltage and power the ideal current source I_s must provide in order to maintain voltage if $R \rightarrow 0$ and if $R \rightarrow \infty$.

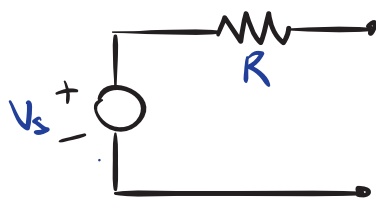
re: limitations of a current source



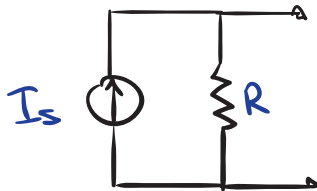


Modeling real sources

No real source can produce infinite power. Some have feedback that controls the output within some finite power range. These types of sources can be approximated as ideal when operating within their specifications. Many voltage sources (e.g. batteries) do not have internal feedback controlling the voltage. When these sources are “loaded” (delivering power) they cannot maintain their nominal output, be that voltage or current. We model these types of sources as ideal sources in series or parallel with a resistor, as illustrated in Fig. src.1. Most manufacturers specify the nominal resistance of a source as the “output resistance.” A typical value is $50\ \Omega$.



(a) real voltage source model



(b) real current source model.

Figure src.1: Models for power-limited “real” sources.