Signal Generator Impedance

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You will often find on signal generators the option to select an impedance (e.g. HighZ, 50Ω). What does this option mean?

We may model a signal generator as a perfect voltage source with a constant internal impedance of 50Ω. Accordingly, we model a simple load as a resistor with resistance defined by the application.

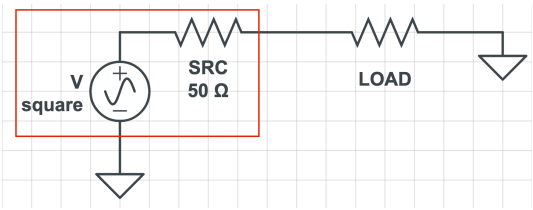

Figure 1: Red box represents the signal generator. The load is represented by a single resistor.

Notice that the internal resistance of the signal generator and the resistance of the load form a voltage divider. The voltage across each resistor is

$$V_i = \frac{R_i}{\sum_i R_i} V \tag{0.1}$$

If the impedance of the load is much greater than the internal impedance of the power supply ($R_{\text{load}} \gg 50\Omega$), then the drop in voltage across the load is approximately V, the output voltage of the ideal source. In this case, we select the HighZ mode on the signal generator.

If however, the impedance of the load is 50Ω, then $R_{\text{src}} = R_{\text{load}}$ and the voltage drop across the load is now $V/2$. To obtain the desired voltage drop V across the load, we switch to the 50Ω mode on the signal generator which causes the voltage output of the signal generateor to be doubled so that the voltage drop across the load is V.

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