

Equivalent Input Noise

An equivalent input noise is a value representing one of the characteristics of amplifiers, such as a preamplifier.

The noise generated inside of the amplifier is considered as generated in the input because the amplifier has a gain itself.

If we model a voltage noise source as “ e_n ”, a current noise source as “ i_n ”, and a signal source impedance as “ R_s ” as shown in Fig. 1, the equivalent input noise voltage is defined by the following equation,

$$V_n = \sqrt{e_n^2 + (R_s \times i_n)^2}$$

Generally, a noise of an amplifier increases as the frequency decreases as shown in Fig.2 .

Sensors and resistors also generate noise.

Because these noises are frequency dependent, the value are usually represented as the voltage density per unit bandwidth ($V/\sqrt{\text{Hz}}$).

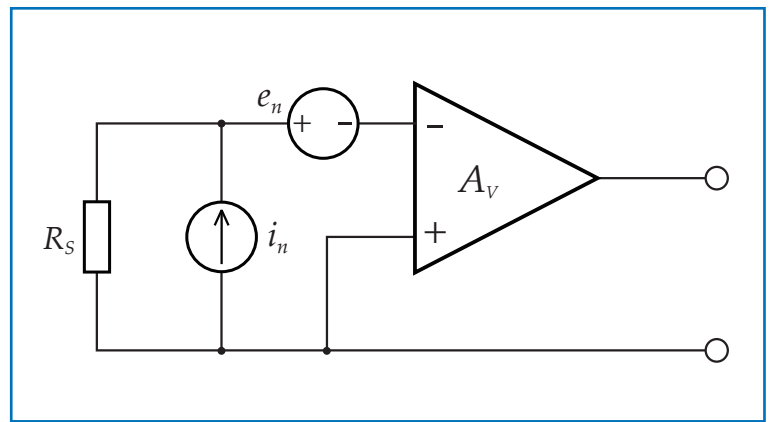


Figure 1. Model Diagram of Equivalent Input Noise

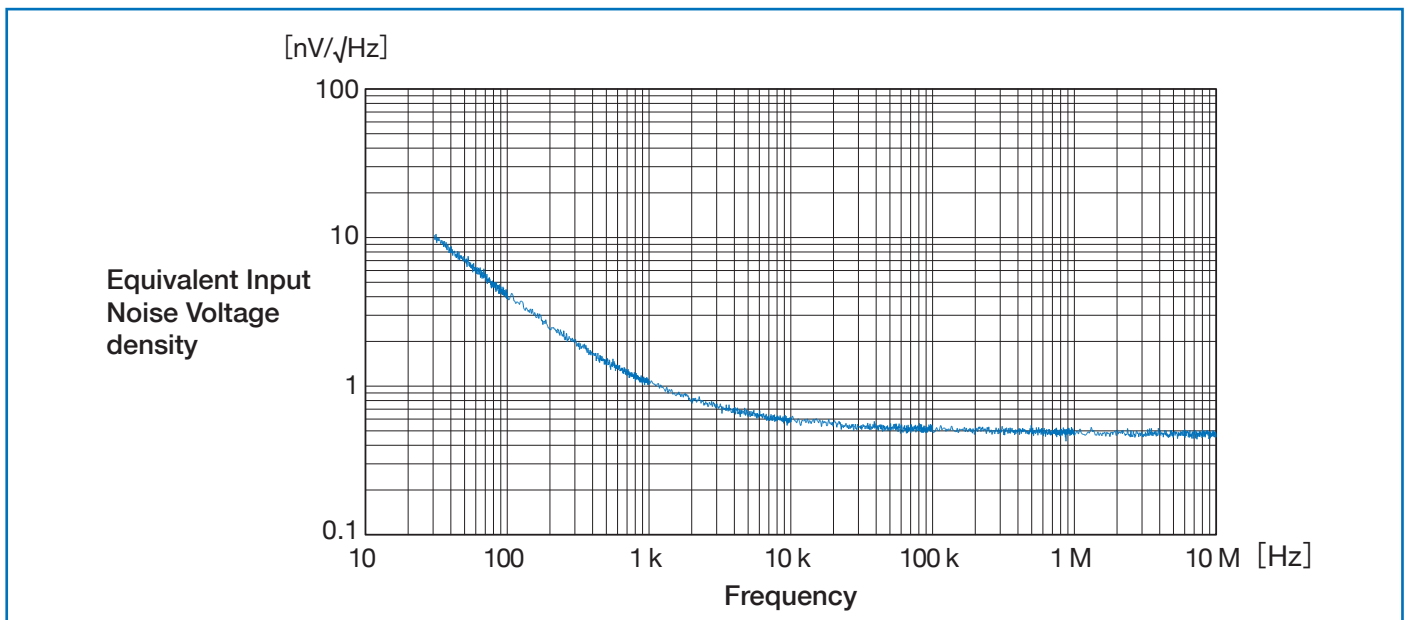


Figure 2. Equivalent Input Noise Voltage density vs. Frequency