The AD9610* is a wideband dc-coupled operational amplifier housed in a 12-pin TO-8-style hermetic can. It combines exceptional dynamic performance with superior dc specifications at reasonable cost, employing thin-film hybrid technology and innovative design techniques. (Prices start at $49.88 in 100s.)

With its ±50-mA continuous output rating and ability to swing ±9 V with a 200-ohm load (±15-volt supplies), 0.1%-settling time of 29 ns max (−55°C to +125°C, gain of 10, 5-volt output step), slewing rate of 2.4 V/ns min over temperature, and maximum total harmonic distortion below −50 dB at 20 MHz, it is useful for such buffer tasks as driving high-speed a/d converters and unloading high-speed DACs, as well as for pulse-generator outputs and imaging and display drivers. In addition, its ability to maintain bandwidth independently of gain makes it useful in providing wideband gains for photodiode preamps—and radar and intermediate-frequency processors.

Another valuable feature is the character of its recovery from overdrive upsets; this is of special importance in non-ideal circuit environments. After the overdriven condition is relieved, the AD9610 comes out of its saturated shutdown mode without damage or performance degradation.

**TRANSIMPEDEANCE OP AMP**

An unusual aspect of the AD9610 is its use of transimpendance (i.e., current-input-to-voltage-output), instead of voltage-to-voltage gain, in the feedback path. Figure 1 illustrates the basic difference between the two approaches and the results—with “ideal” amplifiers—in the inverting case. The voltage amplifier ideally has high input impedance and gain, 1; the error arising from its limited open-loop gain is a direct function of \( R_f/R_i \), which also determines its closed-loop gain (the principle is little different for noninverter circuit, just ground \( V_{IN} \) and picture a voltage source in series with the + input; closed-loop gain is \( 1 + R_f/R_i \)). The dc value of \( A \) is usually so large that it is not often critical in dc amplification, but the usual 6dB/octave reduction of gain with increased bandwidth results in a tendency towards constant gain-bandwidth; e.g., the −3-dB frequency for gain of 50 is about 1/50 of that for unity gain.

In the second case, \( Z_{in} \) is of the order of ohms (ideally zero), and the output is the product of input current, \( I \), and transimpendance, \( r_f \) (of the order of 1 megohm). The ideal closed-loop inverting transfer function is the same (\( R_f/R_i \)), but now the error gain depends only on \( R_f \) (i.e., if \( R_f \) is held fixed and gain is varied by changing \( R_i \) only, there is no change in gain error for changes in the ratio, \( R_f/R_i \), even at frequencies for which \( r_f \) has decreased). Consequently, the −3-dB frequency for gain of 50 V/V in the actual AD9610, 60 MHz, is better than one-half of the 100 MHz bandwidth for a gain of 1.

![Figure 1](image)

Figure 1. Why current-input amplifier closed-loop gain error tends to be insensitive to the gain ratio (and has less variation of bandwidth with closed-loop gain).

*For complete information on the AD9610—8-page data sheet and 14-page application note—use the reply card.*