Many systems require the combination of both a positive and a negative precision 10.0V reference. ADI offers several hybrid ±10V references. Although Burr-Brown offers no ±10V reference at this time, we do have some simple two-chip solutions which are accurate and can be more cost effective. (The lowest cost grades of ADI’s ±10V references are priced at $37.25 (AD2702) and $42.10 (AD2712) each in 25+ quantities.)

Figure 1 shows one two-chip solution. It uses the super-stable REF102 +10.0V precision reference and an INA105 difference amplifier connected as a precision unity gain inverting amplifier. The REF102CM has 2.5ppm/°C max drift. The INA105BM adds drift to the –10.0V output of 1ppm/°C max due to V OS/dT and 5ppm/°C due to gain drift. The V OUT error of the REF102CM is ±2.5mV max. The INA105BM adds ±10mV max error to the –10.0V reference.

Both of the V OUT errors are adjustable to zero as shown in Figure 2. Because the adjustment range is small, instability in the trim components is negligible. Since the +V OUT adjustment affects –V OUT, adjust +V OUT first.

If you need a 1ppm/°C reference, use the REF101 as shown in Figure 3. The REF101 contains the precision resistors needed for the –10V inverter. For a ±10.0V reference, the only additional component needed is an op amp. The 0.6μV/°C V OS/dT of the OPA27AM adds a negligible 0.06ppm/°C drift to the negative reference.

For lowest parts cost, consider the ±10V reference shown in Figure 4. The unity-gain-inverting amplifier in this circuit uses 1% resistors and a 100Ω pot to trim the –10.0V reference output. When using standard 1% film resistors, a –V OUT drift of 50ppm/°C or more should be expected.

The REF101 and REF102 are buried-zener-based references. They have better stability and much lower noise than standard band-gap-based voltage references. Still, there are instances when even lower noise is required. The standard way to lower noise is to lower the noise bandwidth at the output of the reference by filtering (see Application Bulletin 3).

The circuit shown in Figure 5 includes noise reduction filters on both the +10V and –10V reference outputs. The improved filter design shown has several advantages:

1) low output impedance at high frequency for driving dynamic loads,
2) improved noise filtering, and
3) ability to drive large capacitive loads.
Figure 3. Precision 1ppm/°C ±10V Reference.

Figure 4. ±10V Reference Using 1% Resistors.

Figure 5. Precision ±10.0V Reference with Output Filtering.

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