Voltage comparator forms pulse demodulator

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To process low-level ultrasound or radio-range pulses, you need a signal-conditioning amplifier followed by a pulse demodulator to translate the signals to dc pulses. Traditionally, you would use a diode-demodulator configuration (for example, the circuit in **Figure 1a**) with one stage of a single-supply op amp. The circuit in **Figure 1b** does the same job but uses a voltage comparator instead of a diode demodulator. The key to the method is choosing a threshold voltage (V_{TH}) on the negative comparator input that is slightly higher than the dc level of the amplifier output, which is equal to or close to $V_{CC}/2$. The R_4-to-R_6 resistive divider determines the difference between the op-amp bias and the threshold voltage. This difference, calculated to yield an acceptable signal-to-noise voltage, is $V_{CC}R_5/(R_4+R_5+R_6)$.

Or, assuming $R_4=R_5+R_6$, the difference is $V_{CC}R_5/2R_4$. R_3 and C_2 make up a lowpass filter. This pulse demodulator has some advantages: First, its sensitivity is higher than that of a diode demodulator. A 25-mV, 40-kHz, 1-msec input pulse produces a 0.1V output pulse in **Figure 1a**'s circuit, and a 2V output pulse in **Figure 1b**'s circuit. Second, it's convenient and economical to use one more stage of the dual or quad op amp instead of adding discrete components. (DI #2273).

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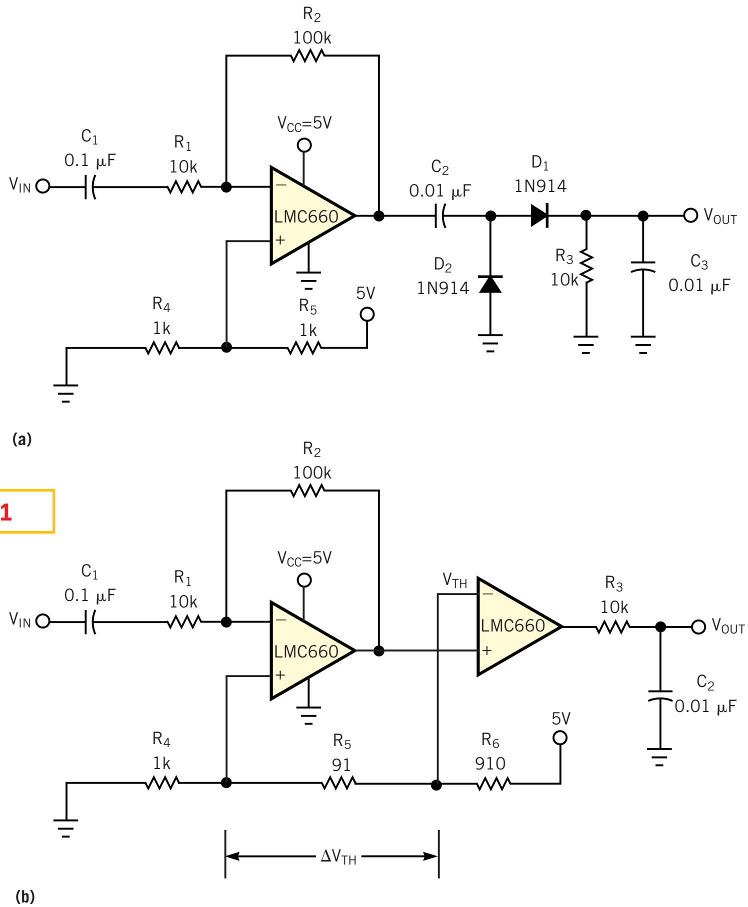
Figure 1



The passive, diode-based approach to pulse demodulation (a) provides a lower sensitivity than the active approach (b).