Function generator has variable frequency

Adolfo Mondragon, Electrolux Products, Juarez, Mexico; Edited by Martin Rowe and Fran Granville - February 17, 2011

The Exar XR-2206 function-generator IC can generate square, triangular, and sinusoidal signals with low distortion. Its output frequency is inversely proportional to the components in an RC network, according to the formula $F=1/RC$.

Use a potentiometer as the resistor component to provide a frequency variation similar to a logarithmic scale. To change this behavior, the manufacturer's data sheet recommends connecting a resistor network to a variable external voltage source. The voltage should be stable and vary from 0 to almost 3V.
Instead of using an external voltage, the circuit described here uses an internal reference voltage of approximately 3V at Pin 7 of the XR-2206. With this internal reference, the circuit requires no voltage regulators—not even in the power supply. The circuit requires a power supply with only a 12V, 500-mA center-tapped transformer, a bridge rectifier, and two filter capacitors (Figure 1). You can define the frequency equations using Figure 2 as a reference.

When \( V_X \) is 0V, you determine the frequency using \( F = 1/RC \). The current trough, \( I_R \), equals \( 3/R \), where 3 is the voltage reference in Pin 7. From this equation and resolving the reciprocal of R, you define the frequency as \( I_R/3R = 1/R \), as a function of the current, \( F = I_R/3C \).

When \( V_X > 0V \), you define the current as \( I_R = (3-V_X)/R \). Replacing \( I_R \) from the previous equation, you can define the frequency as a direct function of the voltage: \( F = (1/3RC)(3-V_X) \).

Figure 1 shows the final circuit to generate the waveforms. The circuit’s frequency ranges from 1 Hz to 100 kHz in five scales. The rotary switch lets you select the scale by switching in a set of capacitors.