

# Function generator has variable frequency

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The Exar (www.exar.com) 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 inter-

nal 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,  $I_{R1}$ , equals  $3/R$ , where 3 is the voltage reference in Pin 7. From this equation and resolving the recipro-

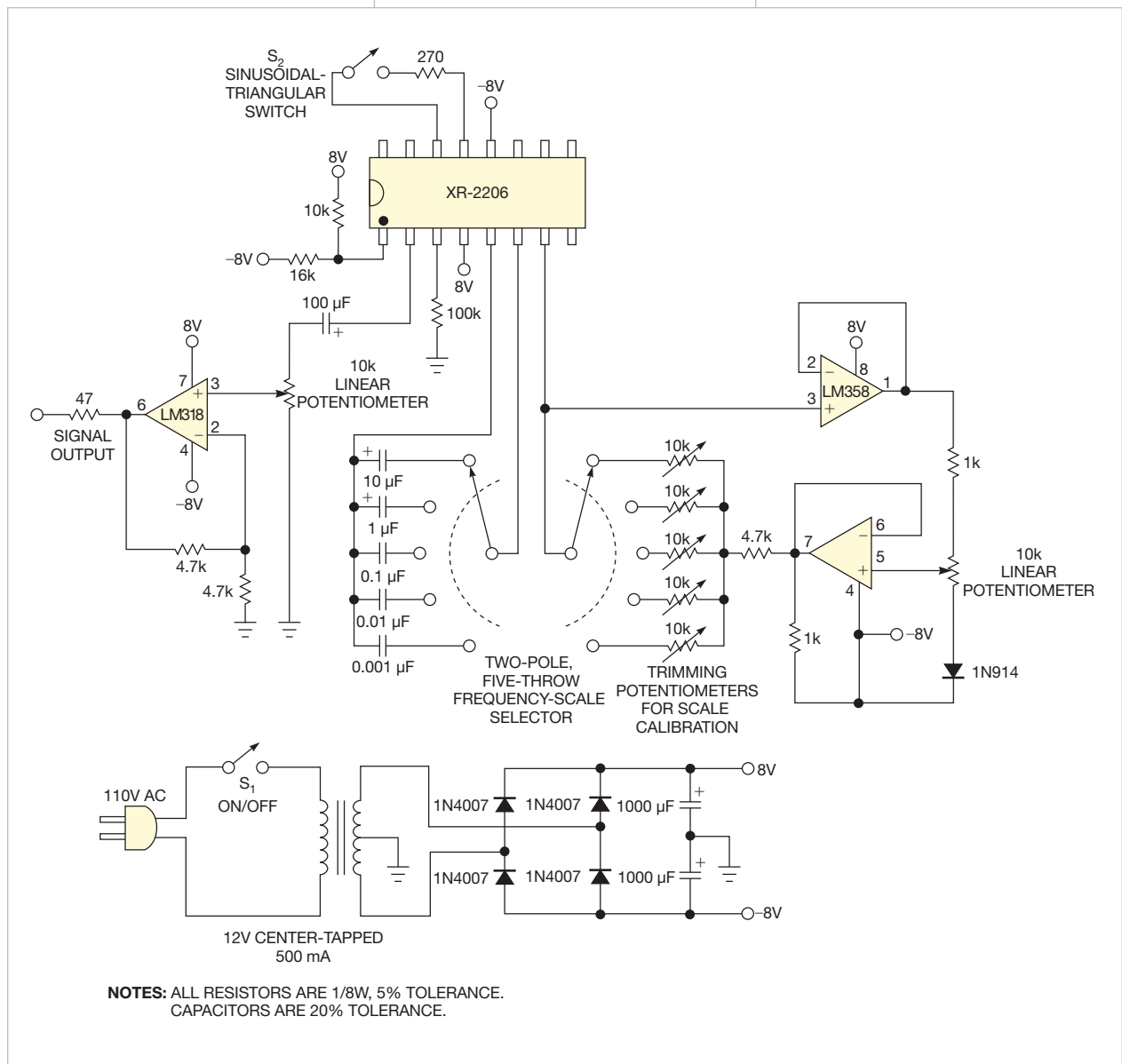


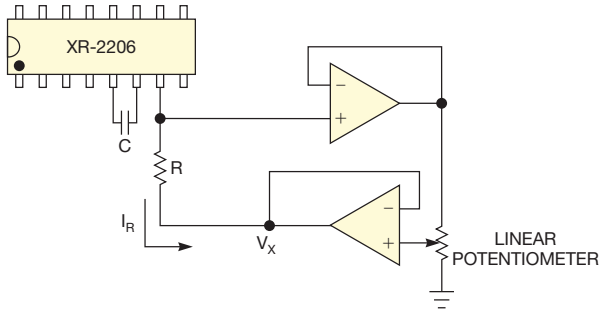
Figure 1 The waveform-generation circuit has a frequency of 1 Hz to 100 kHz in five scales.

# designideas

cal 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. **EDN**



**Figure 2** With an internal reference, this circuit requires no voltage regulators—not even in the power supply.