noninverting input, such that IC_{2A} maintains a virtual potential equal to V_{REF} at the inverting input. Thus, when V_{IN} goes more positive than V_{OUT}, the comparator's output MOSFET turns on, pulling the output down to 0V and impressing a potential equal to V_{REF} across R_1. This action, in turn, injects a current pulse equal to V_{REF}/R_1 into C_1. In most respects, the circuit behaves in the same manner as the circuit in **Figure 1**. As in the dual-rail version, V_{OUT} cannot go below the potential at the op amp's noninverting input. Therefore, even though V_{IN} need not center on a potential equal to V_{REF}, V_{IN}'s positive peaks must exceed V_{REF} for the circuit to work properly.

To select a value for V_{REF}, examine the input and output common-mode-voltage ranges of both op amp IC_{2A} and comparator IC_1 and the maximum peak-to-peak swing of the input signal. For example, setting the positive power-supply voltage, V_S, to 10V and setting $R_A=R_B$ sets $V_{REF}=5V$. The detector accommodates an input signal that swings from 0V to approximately 8V and thus detects positive peak voltages of 5 to 8V. Remember to select R_1 according to the value chosen for V_{REF}. EDN

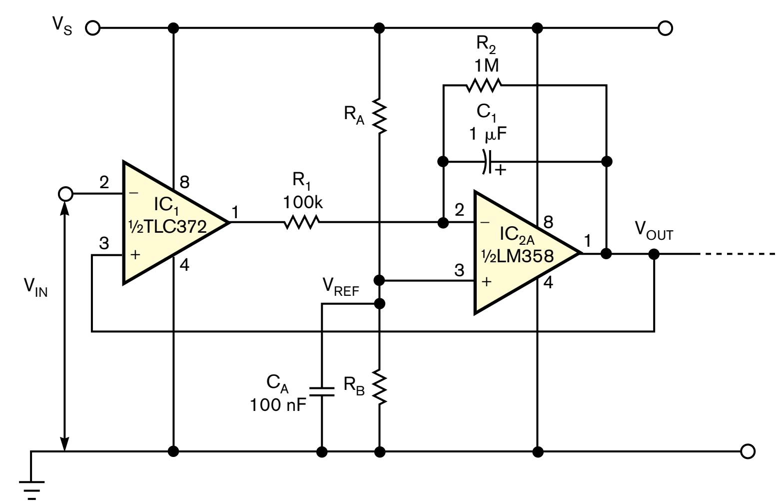

Figure 4 For operation from a single power supply, this version of the peak detector sets a reference voltage via resistors R_A and R_B.

Free program designs and analyzes passive and active filters

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At one time or another, most electrical engineers encounter a requirement to design or analyze an analog filter. Despite an abundance of graphical-user-interface-based digital-filter-design tools, such as The MathWorks (www.mathworks.com) Matlab Signals toolbox, which includes the FDATool filter-analysis package, few general-purpose, intuitive, and free GUI tools exist for synthesis of arbitrary active analog filters. To fill the need for a powerful and intuitive filter-design tool, this Design Idea describes an active-filter-design tool that bioengineering students at the Massachusetts Institute of Technology and at least four other universities use. Although originally implemented to run under Matlab, you can download a free copy of the program's stand-alone version at www.jamessquire.net. Select the "Research" menu and scroll to the software section at the bottom of the page. From the program list, select "Active Filter Design for Matlab" to download a copy of Filter Free 4.0.

Filter Free's functions include third-order analog and IIR (infinite-impulse-response) filters and 10-tap FIR (finite-impulse-response) filters. The program synthesizes filter designs and analyzes the frequency, time, and reflection responses of the ideal, unmodified filters. You can also view transfer functions in standard formats and pole-zero patterns. Using Filter Free, you can select any of 11 filter topologies ranging from gaussian to delay in bandstop, bandpass, highpass, and lowpass responses in five passive, transmission-line, active, switched-capacitor, and digital implementations.

As a design tool, Filter Free simulates a filter's frequency and time-domain responses as assembled using idealized component values. For component-approximation purposes, a round-off option reduces the number of significant figures in components' values. Data-display options include time or frequency response, pole-zero plots, transfer function, and reflection coefficient. You can select graphical plots' axis format, scale factors, and units of measurement.

As a teaching tool, Filter Free can load a user-supplied data file containing a stimulus waveform and simulate a filter's time- and frequency-domain responses. You can download 2000-point data files containing sample waveforms from www.nuhertz.com/filter/sampledata.html. Although the program's user interface is self-explanatory and includes built-in help menus, you can obtain a copy of the program's user's manual in Adobe's pdf format from the download site. EDN