Step-recovery diodes sharpen pulses

Russel Jacob Baker
EG&G Energy Measurements, Las Vegas, NV

The circuit in **Fig 1** uses step-recovery diodes to generate 40V, 1-nsec pulses. The diodes act like charge-controlled switches. When stored charge exists in the junction of a diode, the diode's impedance is typically less than 1Ω. With no stored charge, the diodes exhibit high impedance.

Under steady-state conditions, SRD_1 and SRD_2 are forward-biased and store charge. When you apply an input signal, such as that generated by the circuit in **Fig 2**, SRD_1 starts to discharge and holds the impedance shunting the load to less than 1Ω. The diode switches to a high-impedance state when it reaches full discharge. Since the impedance of SRD_2 is still very low, the majority of the output voltage drops across the 50Ω load resistor, R_{LOAD}. When SRD_2 loses its charge, it switches to a high-impedance state. Then the majority of the input voltage drops across SRD_2.

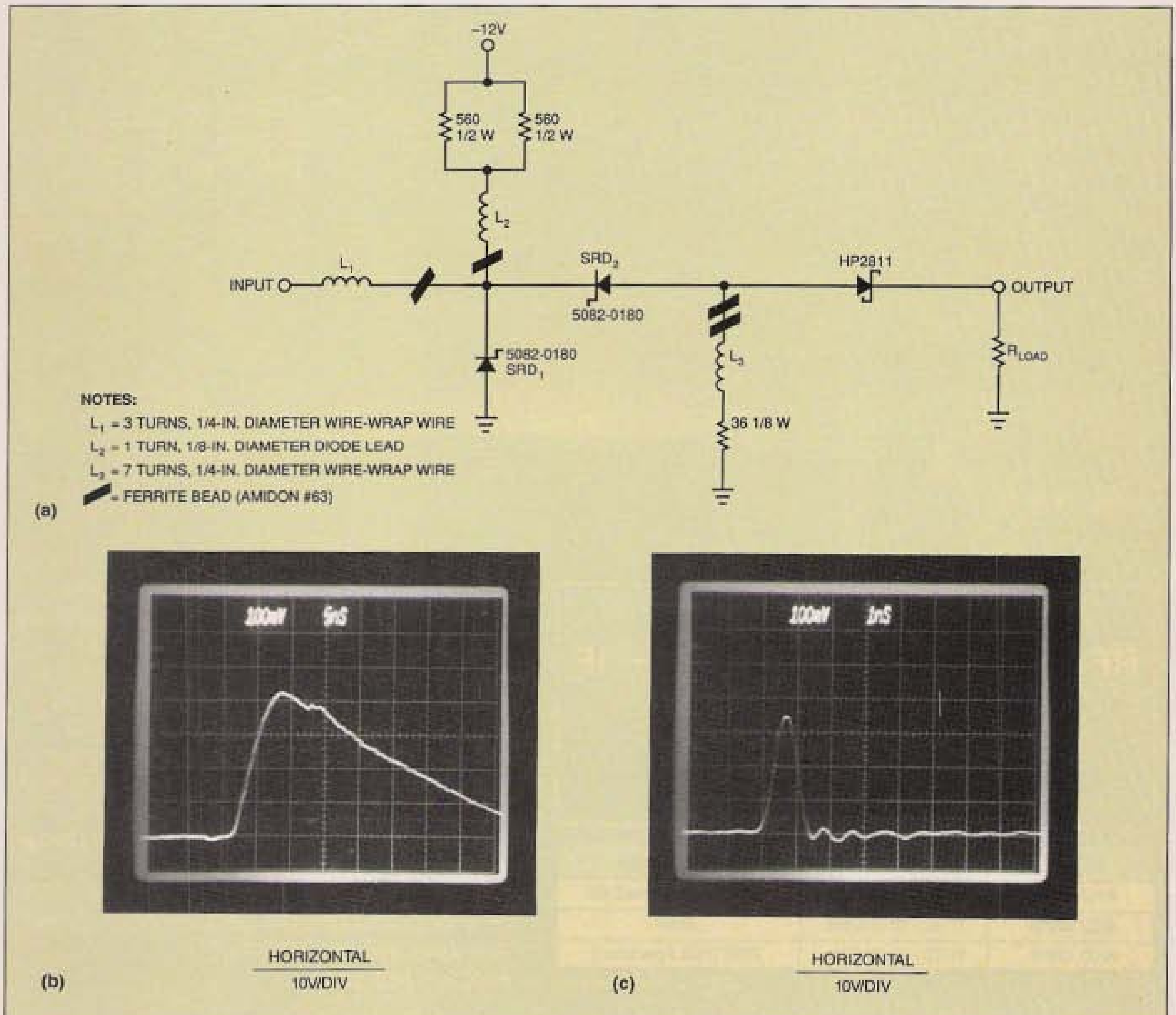

*Fig 1—**By taking advantage of the switching nature** of step-recovery diodes, the circuit in **(a)** generates 1-nsec pulses **(b)** from a wider pulse input **(c)**.*

Inductor L_1 lets the slow input pulse pass but keeps the high-speed output pulse from coupling back into the input. Inductors L_2 and L_3 keep the output pulse from coupling into the power and ground paths, respectively. Using wire-wound inductors and ferrite beads minimizes the inductors' shunt capacitance. When calculating the actual rise and fall times as well as the amplitude of the output pulse, you need to account for the bandwidth of the scope you're using. After taking into account the response of the Tektronix 7104 scope with a 1-GHz plug-in, you'll find that **Fig 1b**'s pulse has a rise and fall time of 350 psec, an amplitude of 40V, and a width of 750 psec at half of the pulse's maximum amplitude, or 20V. The practical repetition rate is approximately 5 kHz if you use **Fig 2**'s driver circuit.

You can modify the amplitude of the output pulse if you adjust the diodes' dc bias by adjusting the values of the 36 and 560Ω resistors. The dc bias through the diodes and the input pulse's shape determine the switch point of the diodes. You can control the width of the output pulse by controlling the dc current through SRD_2. EDN

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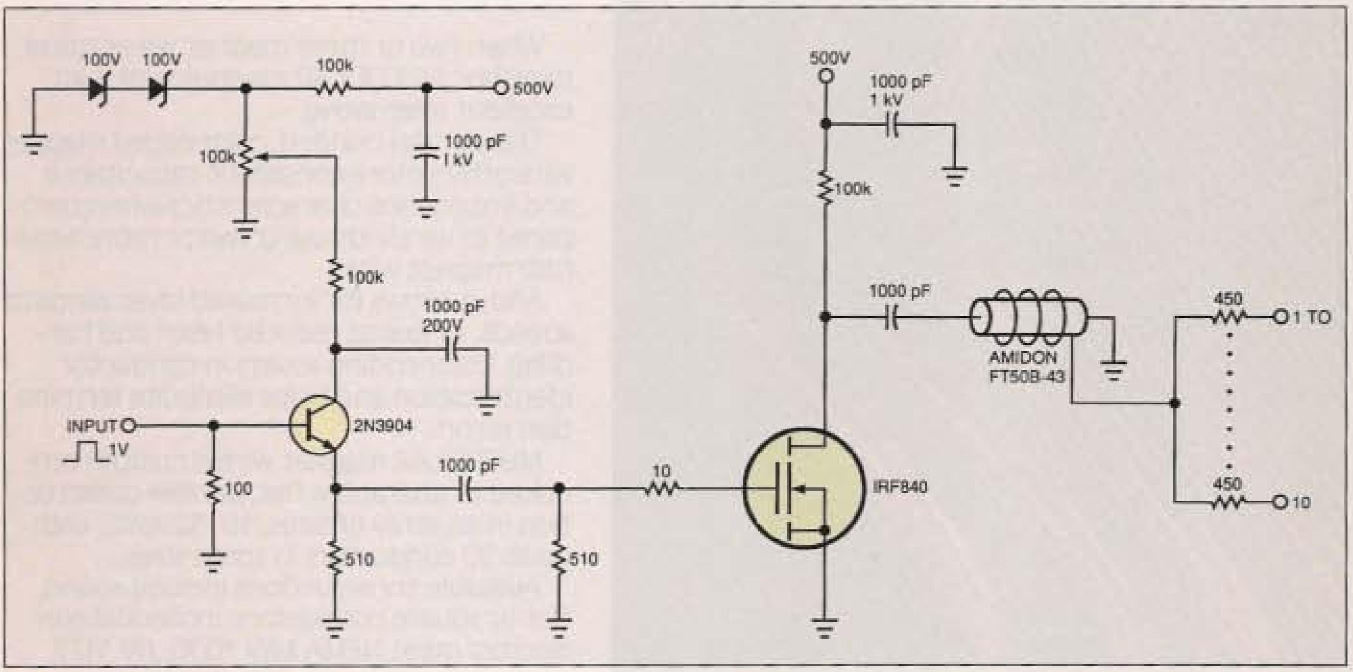

Fig 2—The characteristics of this input driver and the dc bias of the step-recovery diodes determine the diodes' switching points.

Software debounces μP inputs

Kevin Towers
Durand-Raute Industries Ltd, New Westminster, British Columbia, Canada

Listing 1's 68000-family assembly code debounces microcomputer inputs. The algorithm works well as an interrupt routine because the I/O processing doesn't complicate the structure of a controller's main task. How often the main program calls the subroutine sets the debounce time period, which is typically 30 to 40 msec. The program uses two static variables: last_in, which is a copy of the last input byte or word, and iports, which is the debounced input mask the foreground routines use.

The algorithm first inputs the data from the hardware device. Then, the algorithm tests to see which