Design Ideas

Transistor clipper provides flat-top output

Rudy Stefenel
San Jose, CA

If you use the diode clipper shown in **Fig 1a** to clip a sine wave, you won't get a perfect flat-topped waveform because of the diode's forward characteristic. A simple transistor circuit (**Fig 1b**) does a much better job, however, because the transistor's base gets its signals from the circuit input and output.

You can understand the transistor circuit's operation by looking at the effect of each base signal separately. **Fig 2a** shows the circuit with the base signal coming only from the output—a configuration that provides the same result as **Fig 1a**'s diode clipper. **Fig 2b**, on the other hand, shows the circuit with the base signal coming only from the input. With this configuration, the output actually sags, because as the transistor's base gets driven harder as a result of the input pulse's rounded top, the collector saturates harder.

The combination of the two base signals thus provides the flat-top characteristic. For different transistor types, the optimum resistor values might vary.

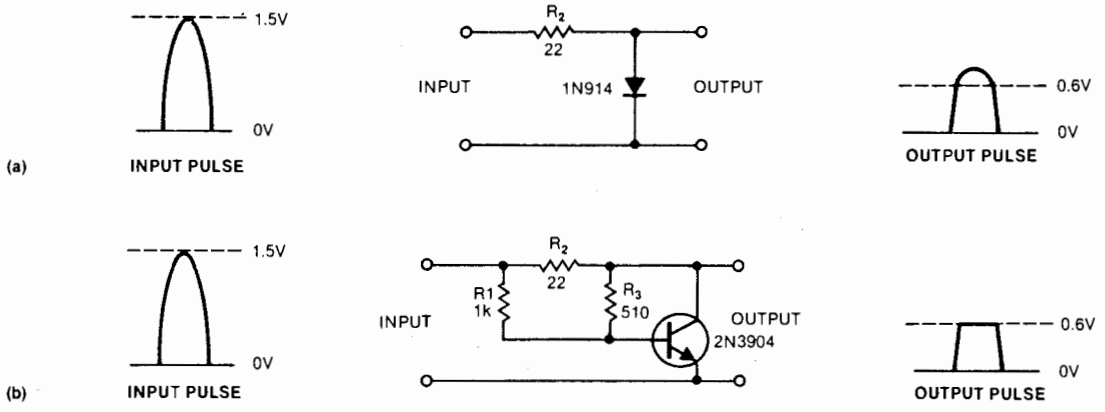

Fig 1—A simple diode clipper (a) *provides a signal with a rounded top when driven by a sine wave. Substituting a transistor whose base accepts two input signals* **(b)** *results in a flat-top characteristic.*

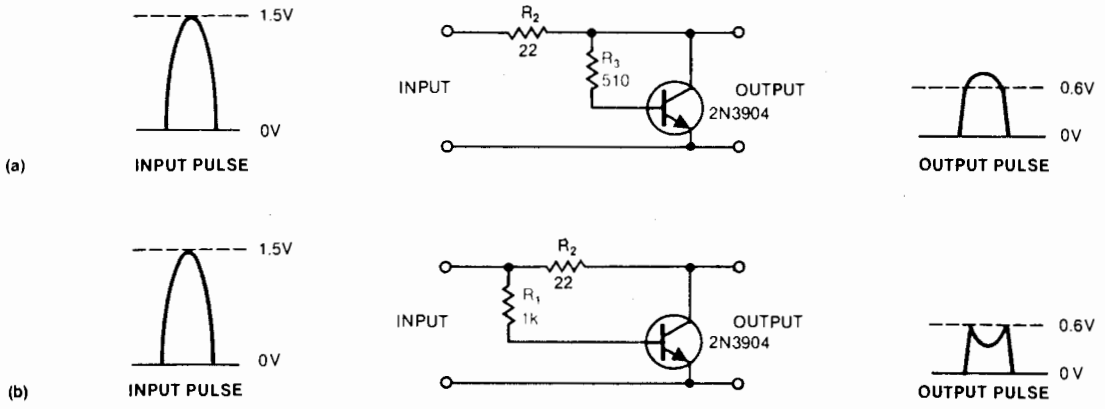

Fig 2—Without the resistor *from the input to the transistor base* **(a)**, ***Fig 1b****'s circuit's action is the same as that of* ***Fig 1a****'s diode clipper. And with the resistor from the output to the base removed* **(b)**, *a sag appears in the pulse's center because the transistor is driven harder there.*

Design Ideas

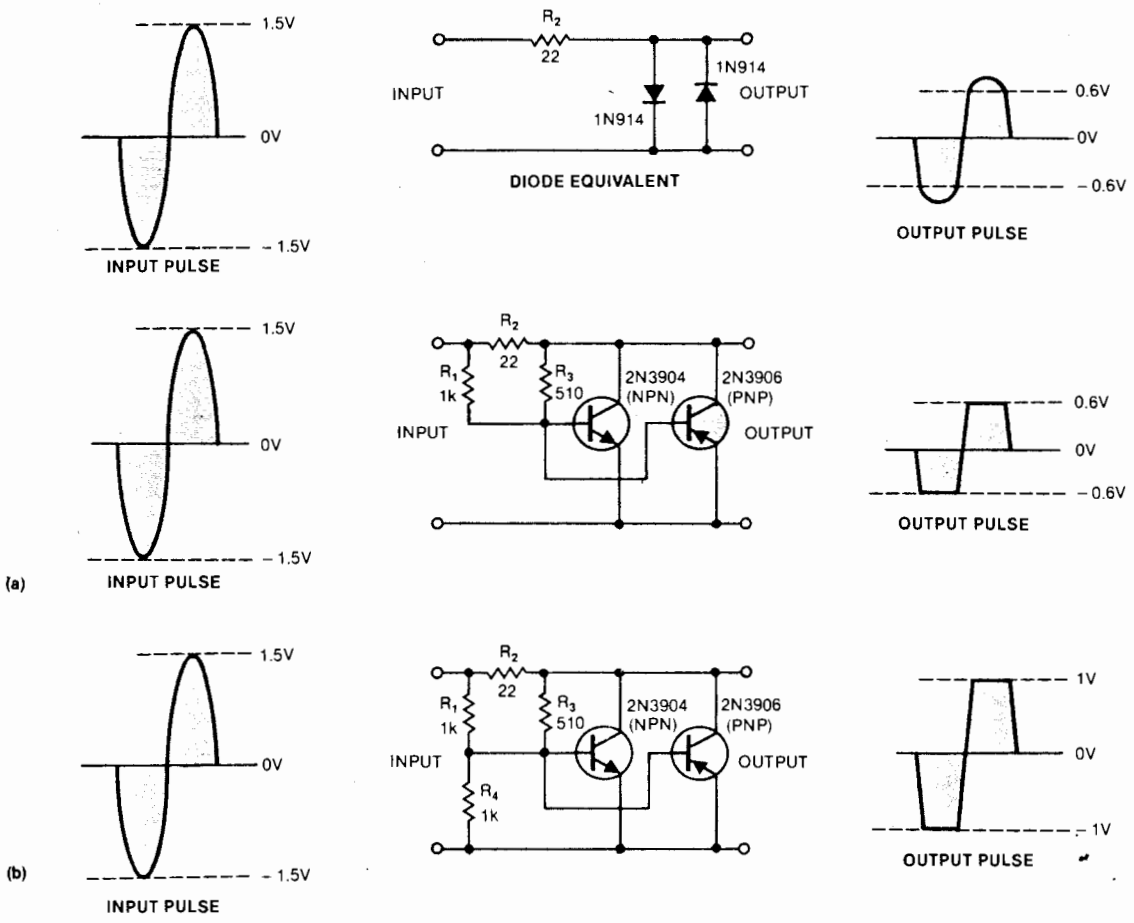

Fig 3—Symmetrical action *results when you add a complementary transistor to* **Fig 1b***'s design* ***(a).*** *And adding a resistor* ***(b)*** *raises the complementary circuit's clipping level.*

Add one component—another transistor—to **Fig 1b**'s circuit, and you have a symmetrical clipper, shown in **Fig 3a** along with its diode counterpart. And add another resistor, and you can raise the clipping-voltage level (**Fig 3b**). This latter circuit functions at levels into the tens of volts. However, at higher voltage levels, it's more efficient to use zener diodes. **EDN**

To Vote For This Design, Circle No 454