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ance input can be used. Thus, a typical 8051 isn't suitable to control a Charlieplexed LED display.

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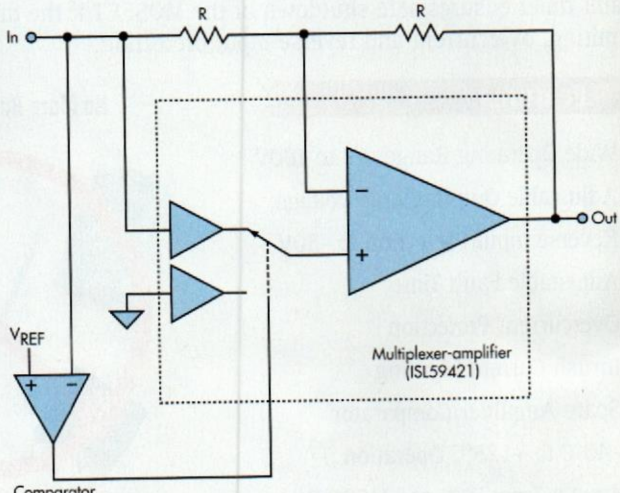
HIGH-SPEED FULL-WAVE RECTIFIER REQUIRES NO DIODES, FEW PARTS

Michael Wong and Tamara Papalias
INTERSIL CORP.

The functionality of our runner-up (originally published in our June 7 issue) is easy to understand, identifying Intersil's ISL59421 as the design's central component. But where did that part come from? Surely it was not developed for this particular application. It turns out that the authors took a rather specialized chip and applied it to a more general problem in a clever and original way.

The ISL59421 data sheet says it "is a 865-MHz bandwidth multiplexing amplifier designed primarily for video switching." Not used in the IFD are the chip's user-settable gain capabilities nor its "high speed three-state function [that enables] the output of multiple devices to be wired together." Other specs validate the part's utility as a video switch.

Don Tuite



1. A multiplexer-amplifier IC combined with an external comparator offers a good alternative to a diode-bridge circuit for full-wave rectification. It saves board space while still allowing a relatively high operating frequency

Systems requiring power conversion and level detection employ full-wave rectification, traditionally provided by a diode bridge. But diode bridges consume a significant amount of board space and reduce signal amplitude. An alternative solution involves using separate amplification for the positive and negative half-cycles and a comparator to switch between them.

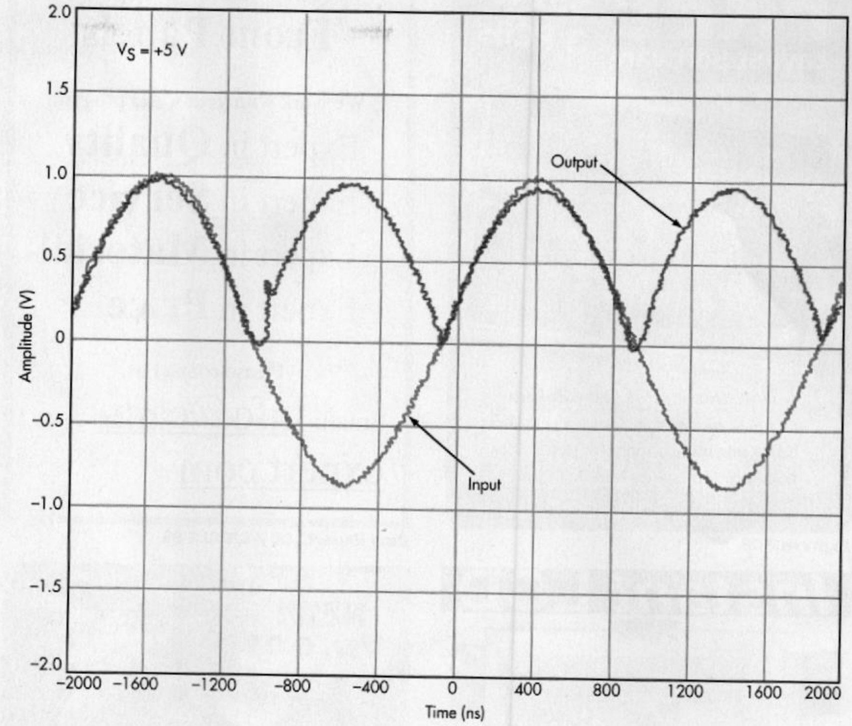
This solution typically requires numerous ICs and can suffer from delay mismatch between the two amplification paths. Because of this mismatch, the multichip solution is acceptable only for low frequencies—where the delay mismatch is an insignificant percentage of the signal wavelength. Thus, designers who require a higher-frequency, broadband solution default to the diode bridge configuration.

A third alternative uses an integrated multiplexer and amplifier along with a high-speed comparator *(Fig. 1)*. Since the amplifiers, switches, and final amplification are integrated in one device, delay mismatch issues are eliminated.

This circuit's frequency limit depends on the propagation delay of each stage. The ISL59421 multiplexer amplifier used in the example adds 20 ns of delay for switching between the inputs. The external, high-speed comparator (ISL55141) typically adds 9.5 ns or so to that. Figure 2 shows the effect of these delays.

When the input crosses 0 V on the negative half cycle, the output waveform exhibits a plateau whose length depends on the sum of the propagation delays through the loop. The small vertical step in the output's positive half cycle shows that the loop has recovered from the switching operation and the output amplitude again equals the absolute value of the input voltage.

Since the delay is a fixed amount, the distortion will increase as frequency rises. Therefore, the maximum operating speed will be determined by the amount of distortion the application can tolerate. In this 500-kHz example, the 30-ns delay causes distortion for 1.5% of the period.



2. The plateau in the output waveform, where the input waveform crosses 0 V on the negative half cycle, is caused by the total delay in the multiplexer-amplifier and the comparator.

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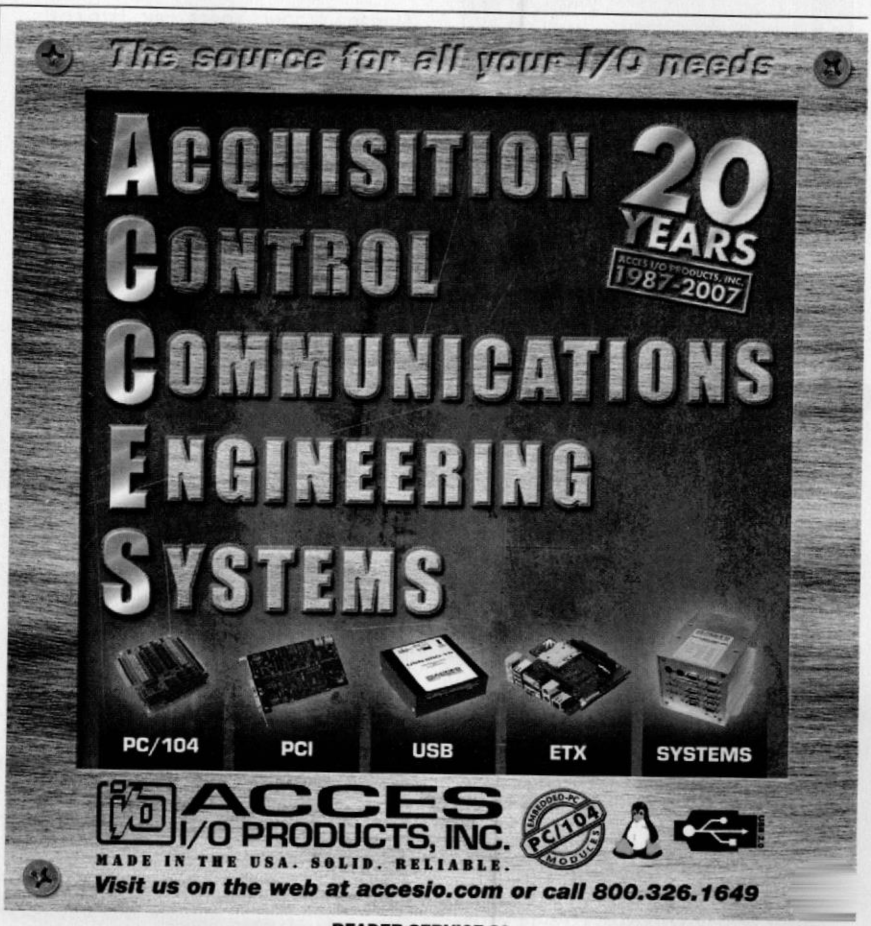

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