

# Circuit & Design Ideas

Interesting circuit ideas from readers and technical literature. While this material has been checked as far as possible for feasibility, the circuits have not been built and tested by us. As a consequence, we cannot accept responsibility, enter into correspondence or provide constructional details.

## Frequency doubler uses one comparator

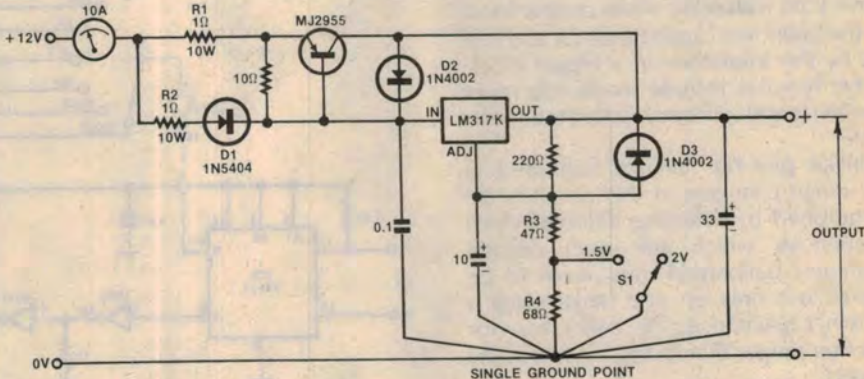
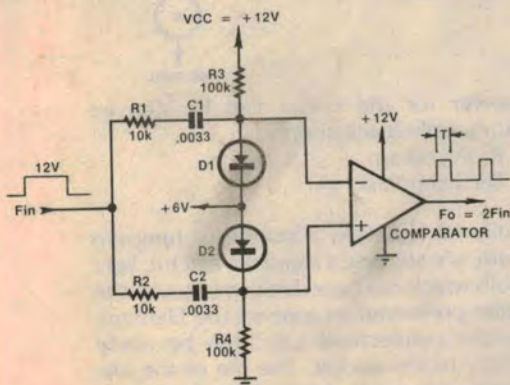
Based on a single comparator IC, this simple circuit produces rectangular pulses at twice the input signal frequency. It does this by producing a positive output pulse of duration  $T$  on both the rising and falling edges of a square wave input signal.

Here's how it works: On the rising edge of the waveform, D1 is forward biased and D2 is reverse biased. Consequently, the non-inverting input will be at  $V_{cc}$  while the inverting input will be at  $0.5V_{cc} + 0.6V$ . The output of the comparator thus switches high, and remains in that state until C2 charges to the level where the voltage on the non-inverting terminal falls below the voltage on the inverting terminal. The output of the comparator then switches low again.

Similarly, on the falling edge of the input waveform, the inverting input of IC1 is grounded (D1 reverse biased) while the non-inverting input is set to  $0.5V_{cc} - 0.6V$  (D2 forward biased). The output of the comparator thus switches high again and remains in this state until C1 charges.

The duration of the output pulse ( $T$ ) is adjustable for both the rising and falling edges of the input waveform. It is given by  $K(R1 + R3)C1$  for the falling edge and  $K(R2 + R4)C2$  for the rising edge, where  $K$  is a constant that is dependent on  $V_{cc}$  and the input voltage. In the example shown, both sections of the circuit are identical and the period  $T$  is about 0.31ms.

From "Electronics", May, 1983.



## Glow plug driver for model aeroplanes

This glow plug driver circuit was developed as a result of dissatisfaction with existing circuits or devices. It has a regulated output voltage switchable between 1.5 and 2V, is short-circuit protected, thermal overload protected, and output current limited.

Diode D1 is used to keep the voltage across resistors R1 and R2 approximately equal. The maximum current through R2 is approximately equal to the maximum current through the LM317K. This is approximately 2.5A but varies between brands; some will pass only 1.5A. In the above design the current through R1 and R2 is approximately equal so the maximum output current is about twice the maximum current of the LM317K.

The LM317K and the MJ2955 are mounted on a common heatsink (Dick Smith cat No. H-6704) as close together as possible. This allows

excessive heat in the MJ2955 to activate the thermal overload circuitry in the LM317K. Both devices must be mounted with thermal grease, insulating washers, and plastic insulator caps.

To check the maximum output current short the output briefly and read the meter. Between five and six amps is sufficient to drive a glow plug. If the reading is less than 5A the value of R1 must be reduced by connecting resistors in parallel with it.

The resistive divider in the output circuit gives 2V with switch S1 open and 1.5V with it closed. Heavy flexible cable is needed to connect to the glow plug to minimise losses. Twin 4mm auto cable, about 1.2m long is adequate. The input should use similar wire.

An alternative, and more economical, regulator is the LM317T. This could be bolted to the heatsink underneath the MJ2955. Resistor R1 would be 0.47Ω and R2 1.5Ω.

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## IC sockets and double sided boards

A problem with IC sockets – as distinct from ICs themselves – is that they are not designed for soldering to double sided boards. The following solution to this problem is both simple and effective.

First, when preparing the board, drill the IC pin holes slightly oversize. Then thread a fine gauge wire, such as tinned fuse wire, through each hole, bend one end over, and secure

it to the copper pattern with a dab of solder.

Cut the wire on the other side of board and secure that end similarly, taking care that the solder does not flow over the hole. Do this for each hole, then insert the socket all pins securely.

If carefully done the result is as effective as plated-through holes, but does not require any special equipment.

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