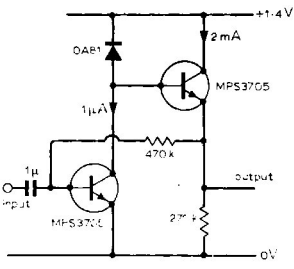
Low-current source

It is possible to use a reverse-biased germanium diode as a voltage independent current source for loading silicon transistors. Advantages of this method are less voltage lost across the source when compared with f.e.ts and similar sources, it is cheap, and the diode I_R increases with temperature in much the same manner as the h_{fe}. I_{cbo} in a transistor. The last point allows reliable micropower circuits to operate over a wide temperature range at



optimum current drain. This principle was applied in the amplifier circuit shown. The diode leakage current is arranged to be greater than the collector-emitter leakage of the transistor, permitting linear operation. Performance figures are: a voltage gain of 50, a −3dB bandwidth from 16Hz to 4kHz, a maximum output into 1MΩ of 500mV pk-pk (at 300Hz), an input impedance of 10kΩ (at 500Hz), and a consumption at 20°C of 4μW.

Owing to manufacturing tolerances the operating point can only be guaranteed to within a decade or two, and the diode capacitance is extremely non-linear at low reverse voltages.

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