

Section E Basic Transistor Circuits

Basic Feedback Pair

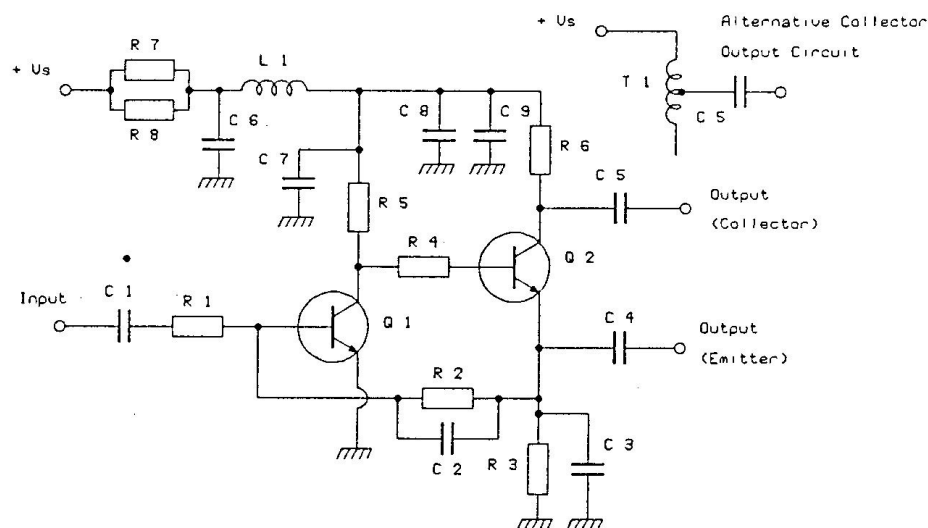
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Design

This circuit is based on a high gain inverting amplifier consisting of common emitter stage Q 1 followed by emitter follower Q 2. The common emitter stage is operated with no emitter degeneration, Q 1 emitter being directly grounded.

Resistors R 1 and R 2 provide feedback in a similar manner to that employed in an inverting operational amplifier circuit. This results in a constant and stable gain over a wide bandwidth.

Circuit Diagram



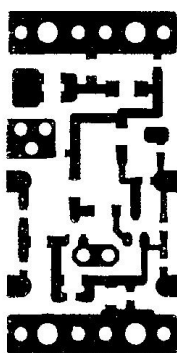
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The gain from the input to Q 2 emitter is given by $R 2 / R 1$. A useful measure of additional gain may be obtained by taking the output from a load inserted in Q 2 collector circuit, in which case the gain becomes $(R 6 / R 3) \times (R 2 / R 1)$. Driving the load through autotransformer T 1 is beneficial when a low value of load such as 50 Ohms must be driven. Assuming a 2:1 step-down ratio, the 50 Ohm load appears in Q2 collector as 200 Ohms, increasing the gain by 4 x relative to 50 Ohms. The step-down ratio, however, reduces the net increase in gain to 2 x or 6 dB. For broadband performance, T1 should be made a transmission line or "Ruthroff" transformer consisting of a twisted wire line on a small toroidal core.

The feedback pair provides a simple low noise amplifier design capable of 20 to 30 dB of gain over a few hundred MHz of bandwidth. The frequency response may be optimised by choice of C2 and C3.

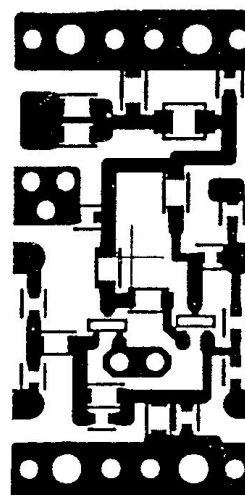
Care should be taken to remember that the signal source impedance forms part of the feedback network, hence instability may result under certain source conditions.

Track Pattern (Full-Size)



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Component Placement (1.4 x Full-Size)



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