

# Mosfet hf mixer

Figure 1 shows a typical dual-gate hf mixer, which provides reasonable, low-cost intermodulation and noise performance.

The improved circuit in Fig. 2 employs the mosfet as an amplifier rather than a mixer, an arrangement that allows the mosfet to be biased for best noise figure.

Transistors  $Tr_{2,3}$  provide the multiplication needed for mixing and act as switches. Inductor  $L_1$  and  $C_4$  resonate at the if and  $R_4$

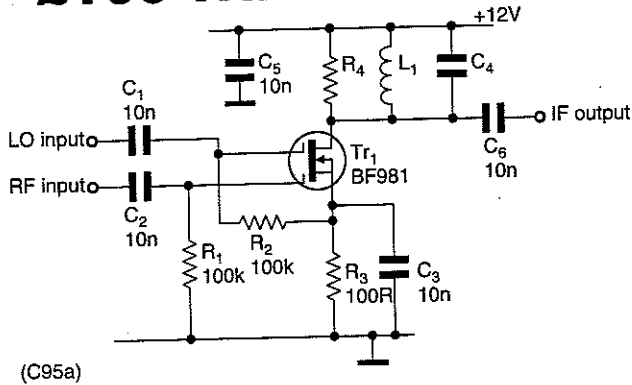
represents the if load.

Local oscillator input must be around 20mV pk-pk from a low impedance such as 50Ω and output inductor  $L_1$  is bifilar wound on a ferrite core for best balance. These modifications to the original circuit provide higher gain and a lower

noise figure and higher intermodulation intercept to give an improvement in third-order dynamic range.

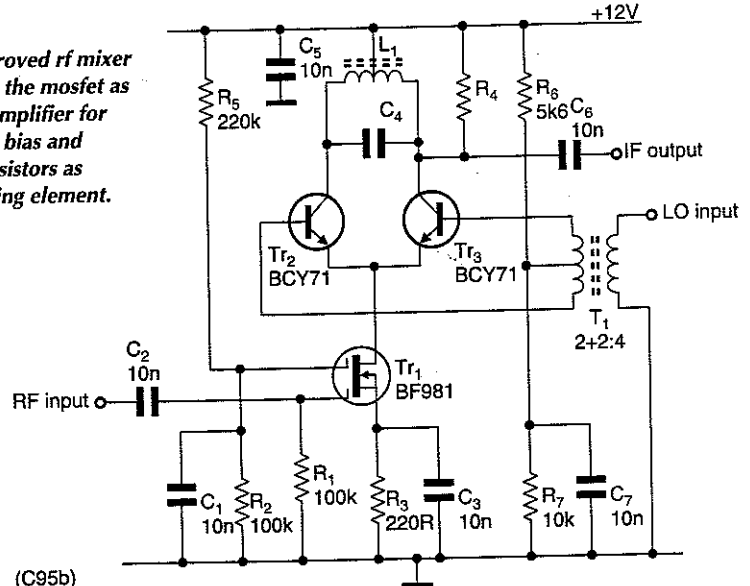
**P Goodson**  
Bracknell  
Berkshire  
C95

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(C95a)

*Improved rf mixer uses the mosfet as an amplifier for best bias and transistors as mixing element.*



(C95b)

# Wide-band amplitude modulator

Gain of this amplitude modulator is constant for carrier frequencies between 10kHz and 50MHz. The circuit linearly

modulates the carrier by up to 100% using a modulation signal between 10Hz and 200kHz. Modulating input varies the

current through  $Tr_3$  and therefore the gain of the emitter-coupled amplifier  $Tr_{1,2}$ . Output of the amplifier is a composite of an amplitude-modulated carrier and the modulating frequency, the latter normally being removed by a filter.

Since the modulating frequency appears at the two collectors in common-mode, the differential op-amp amplifier rejects it, while amplifying the two am signals normally. The avoidance of filtering confers a wide-band performance.

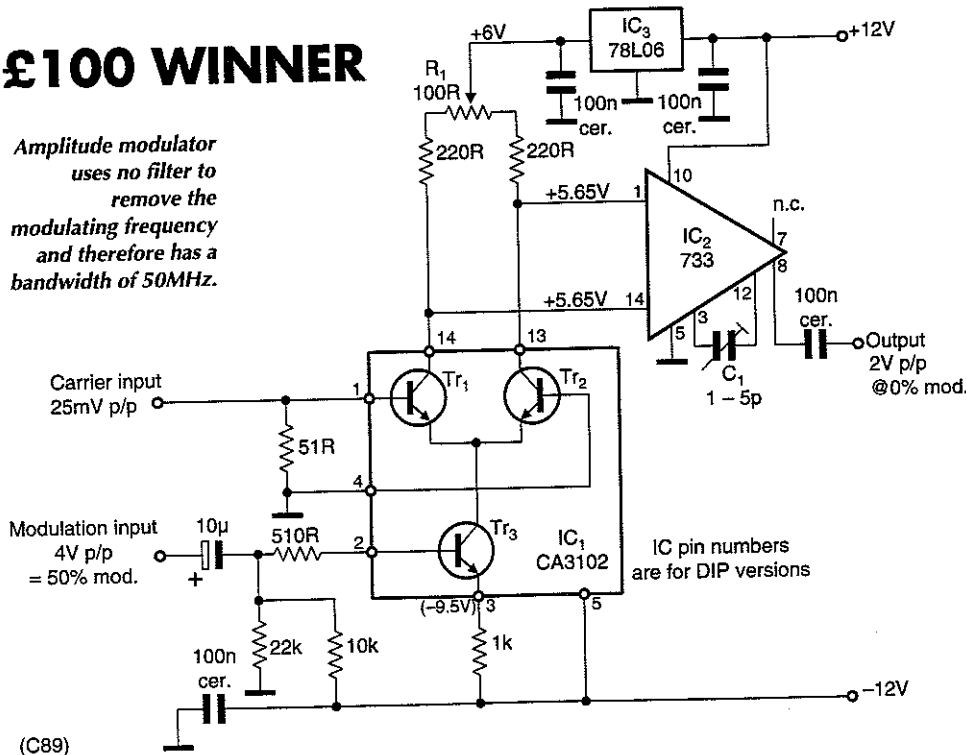
Trimmer  $C_1$  increases the gain of the op-amp to counteract precisely the fall-off in gain of the emitter-coupled amplifier, while the potentiometer  $R_1$  sets symmetry of the rf envelope when modulated to 50% by a 200kHz input, the carrier being anything over 2MHz.

The circuit is affected only minimally by temperature.

**John Gibson**  
Berkeley  
California  
USA  
C89

## £100 WINNER

*Amplitude modulator uses no filter to remove the modulating frequency and therefore has a bandwidth of 50MHz.*



(C89)