Subject: An AF amplifier stage

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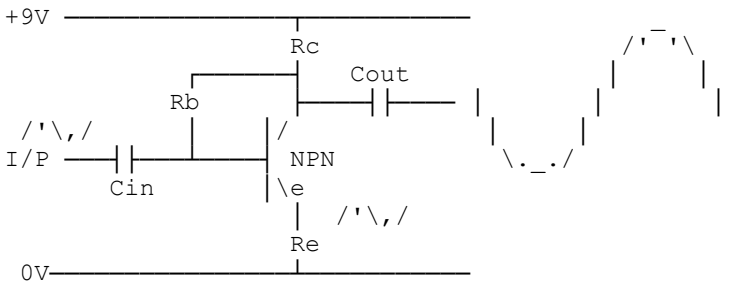
To : TECH@WW

By G8MNY (Updated Dec 04)
This simple amplifier circuit is easy for calculations.



BASE BIAS R = Hfe x (Rc+Re) Approx
To get ½ the DC swing on the O/P. This is because we want the same voltage C—E (almost the same as across Rb) as across the total load R of Rc+Re.

GAIN = Rc/Re approx (Rc may be lower due to external load).
With high Hfe then Ie approx = Ic, so the emitter NFB Re controls the collector current making the voltage gain just the voltage drop ratio of Rc/Re. Assuming no external loads. For high gain applications Re includes the internal emitter R of the transistor (typically a few ohms).

O/P Z = XCout + (Rc // ((G—1) x Rb))
This is the added components, including the apparent fraction of the bias Rb with load current in it.
"//" means in parallel, many of the paralleled terms are insignificant.
Technically the amount that (G-1)x Rb component that affects the O/P Z it will also depend the I/P source Z.

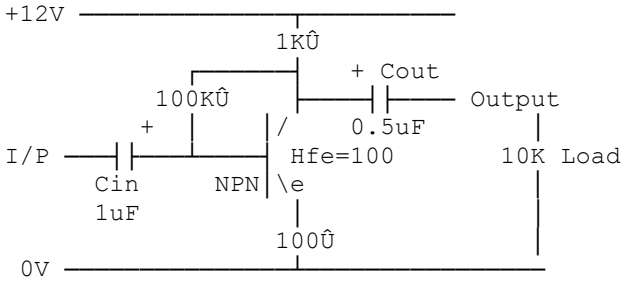
I/P Z = XCin + ((Hfe x Re) // (Rb/(G+1)))
This is the added components, including the apparent fraction of the bias Rb with input current in it.
"//" means in parallel, many of the paralleled terms are insignificant.

LF Roll off Cin & Cout affect the LF response. Basically each one will give —3dB & 6dB/Octave roll off when Xc equals the source + load Zs.

HF Response
Intrinsically limited by the transistor's FT when the Hfe becomes 1, & component layout (inter capacitance) causing Miller HF N.F.B. effects between O/P & I/P.

HF Compensation
HF loss can be compensated for by putting a suitable C across Re to give +3dB boost were Xc=Re, eg. where the measure drop is -3dB. The 6dB/Octave lift after that should flatten the amp losses out. The input Z will be reduced at HF though. Not often used!

EXAMPLE



So in the above example Collector should be around +6V
Gain about 9 times
O/P Z about 900Û + XCout
I/P Z about 5KÛ + XCin

LF response with Input source Z of zero, & O/P load of 10K...
I/P —3dB LF roll off, @ 31Hz where Xc = 5KÛ O/P —3dB LF roll off, @ 29Hz where Xc = 10.9KÛ
Giving —6dB @ 30Hz & 12dB/Octave LF cut.

Why don't U send an interesting bul?

73 De John, G8MNY @ GB7CIP
/EX