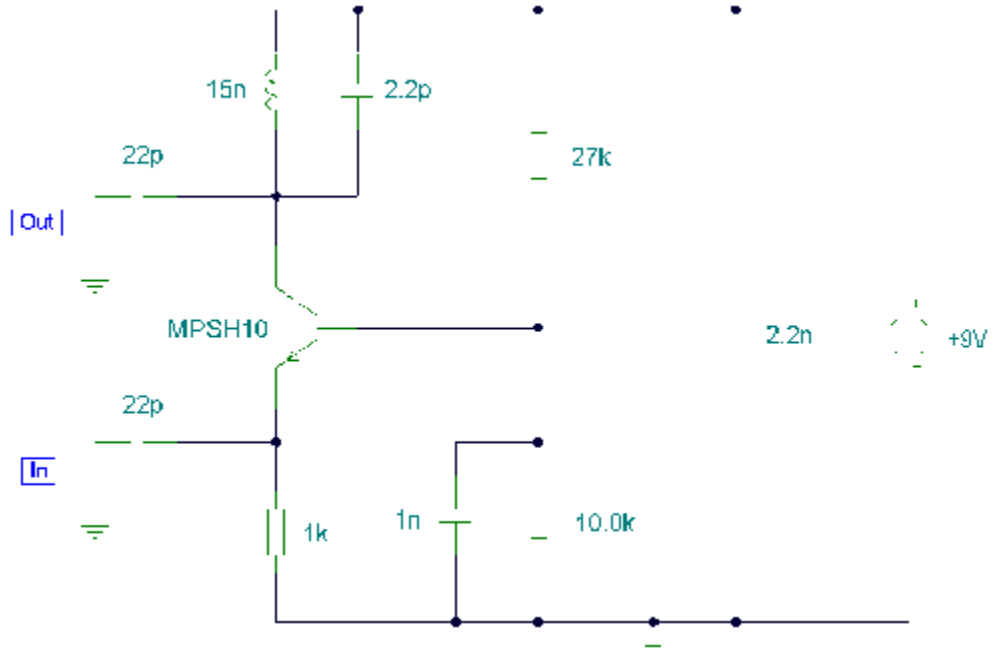
UHF Preamplifier

This circuit is designed to work at UHF frequencies in the range 450-800MHz. It has a gain of around 10dB and is suitable for boosting weak TV signals. The circuit is shown below.



The MPSH10 transistor used is available from Maplin Electronics order code CR01B. Alternatives that may be used instead are BF180 and BCY90. The tuned circuit comprising the 15nH inductor and 2.2pF capacitor resonate in the centre of the UHF band. The 2.2pF capacitor may be exchanged for a 4.7pF or a trimmer capacitor of 2-6pF to improve results. The approximate frequency response is shown below. N.B. This is a simulated response using the TINA program produced by using a swept 20uV input swept over the frequency range 400-800MHz. Output was measured into a 1k source and the frequency generator has a 75ohm impedance.

Construction

The coil is half a turn of 18-20 SWG copper wire bent around a half inch drill bit. This ensures a low Q and therefore broad tuning. High frequency work requires special construction techniques to avoid instability (unwanted oscillations) caused by feedback from output to input. Veroboard is not suitable for this project as the capacitance between tracks is around 0.2pF. A better approach is to use tag-strip

or a PCB. The circuitry should be enclosed in a metal case and a screen made between input and output. As the transistor is used in common base mode,its low input impedance is a good match for 50-75 ohm coax cable, whilst at the same time providing full voltage gain to the upper frequency limit of the device. The 15nH inductor load, having almost a short circuit impedance at DC, has an impedance of 56ohms at 600MHz. This inductance and 2.2pF capacitor form a tank circuit at the transistors collector, providing maximum gain at resonance. Note however that the voltage gain will be reduced under load, when the circuit is connected to the input of a TV set or a very long piece of coaxial cable for example. Hence the simulated Tina plot.