Simple Class E Transmitter

Class E amplifiers are very efficient amps and are generally built with MOSFET transistors. The principle is to drive the MOSFET's gate input with square waves to quickly put the device into it's low ohmic region and to do this when the voltage across the drain of the MOSFET is at or near zero volts. This greatly reduces the heat dissipated by the MOSFET and increases efficiency. A choke value for the drain is chosen so that it resonates at the operating frequency, in combination with the parasitic capacitance of the drain and the output filter. The "fly wheel" effect of the resonant tank causes the drain voltage to drop to zero before the MOSFET is switched back on. Efficiencies of 70% or more can be achieved this way.

The circuit show below is a simple Class E transmitter and is shown built for 40 meters. It uses a 74HC02 NOR gate as a crystal oscillator. The other three gates in the package are used to gate the clock signal to the output MOSFET. The crystal oscillator can also be used with a direct conversion receiver. An Rx offset curcuit is shown to shift the oscillator frequency when receiving.

A 2N7000 is used for the final power amp. Although only one is shown, three '7000's are used in parallel to reduce the "on" resistance, which inproves efficiency. 70-75% efficiency can be achived. The amplifier delivers about 2 watts output with a 9 volt supply and about 4 watts with a 12 volt supply. The plastic TO-92 2N7000's bearly get warm to the touch.

For best results the spacing on the output filter inductors with need to be "tweaked". Monitor the drain current and output power and calculate efficiency. Adjust the spacing of the windings on the output filter inductors until you get the best efficiency. L2 will have the greatist effect. L5 and C15 are used to suppress VHF spurs, which aren't effectively attenuated by the HF low pass filter.

If the square wave drive to the fet is simply gated on and off, the keying waveform is very steep and causes key clicks. Therefore, the supply voltage to the PA needs to be

ramped up and down in order to provide for a least some wave shaping. Q1 is a PNP power transistor which is turned on and off by Q2. C19 slows the turn on and turn off time down and causes the voltage on the collector to rise and fall with about a 5 ms time constant. R5 and C14 form a delay to keep the drive active to the PA while the supply is ramping down.