Paralleling MOSFETs in RF Amplifiers

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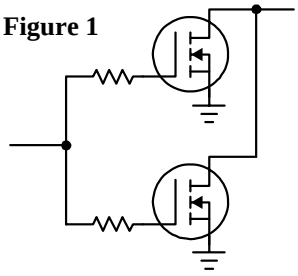
When two discrete MOSFET devices are connected in parallel, they will oscillate when forward bias is applied. Together they form a VHF multivibrator circuit. The oscillation frequency is determined by inductances of the connections between them, including bond wires, the devices' internal parasitic capacitances, and the supply voltage. For medium-sized transistors with good high frequency gain, the oscillation frequency can be up to 500 MHz. Unchecked, it can destroy the devices.

Figure 1



The most common method used to prevent the oscillation is to insert a resistor in series with each gate, typically 3 to 10 ohms, as shown in Figure 1. This is effective and economical but it reduces the HF gain of the pair.

An alternative method employs a 0° splitter, as shown in Figure 2. The splitter provides equal drive to the gate each device while providing enough isolation between them to prevent oscillation. The load resistor dissipates only the amplitude difference, if any, and is not critical to the operation.

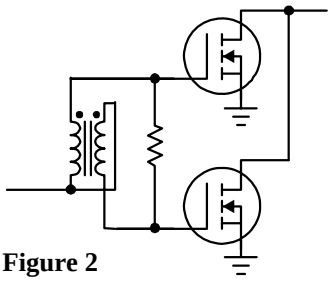


Figure 2

Figure 3 shows a broadband amplifier employing paralleled MOSFETs using the splitter method to prevent oscillation. In this example, a 4:1 impedance transformer has been placed at each gate before the splitter to increase the impedance at which the splitter operates and secure a broadband input match.

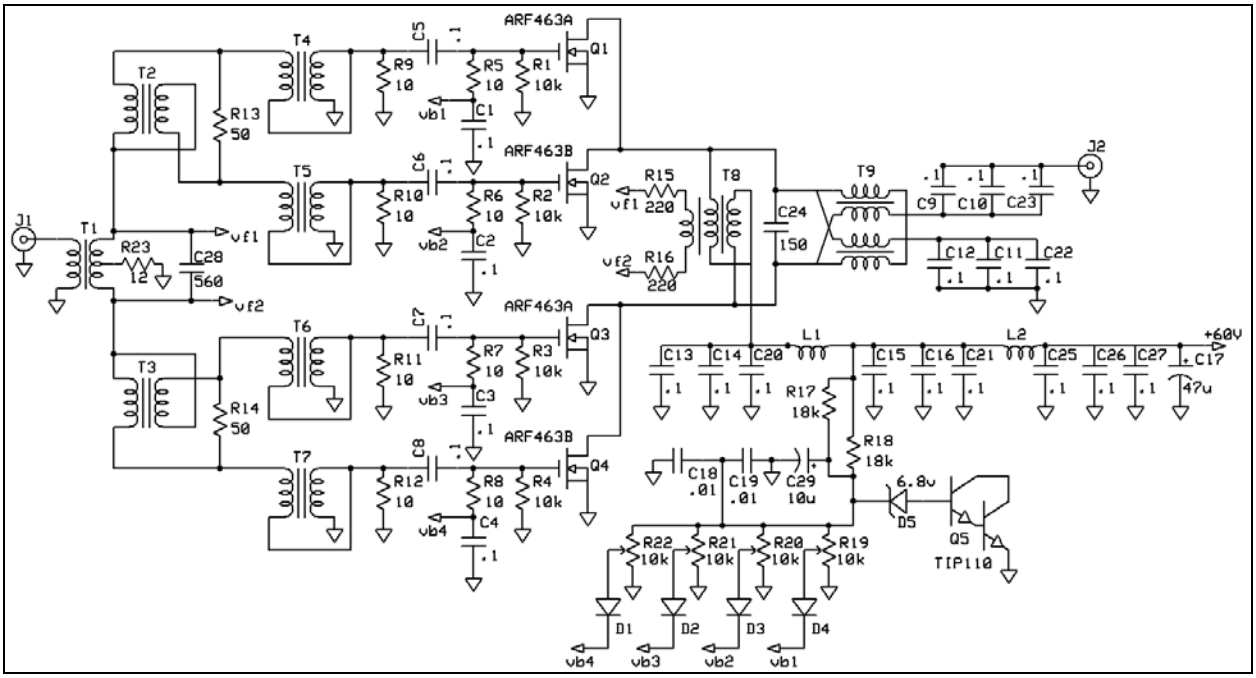


Figure 3

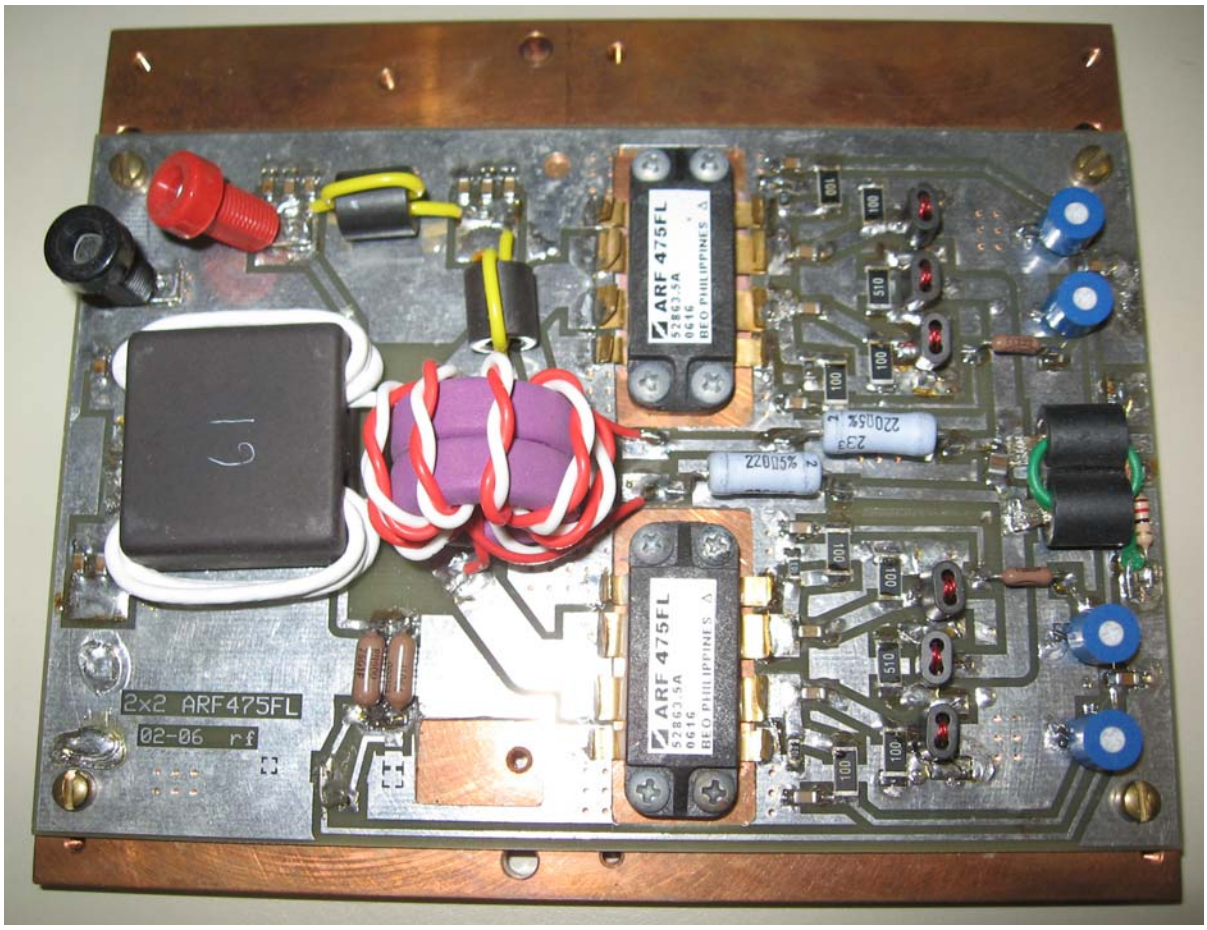


Figure 4

The completed amplifier is shown in Figure 4. It operates from 1.8 to 30 MHz and can provide 450W CW. In this example, the transistors used are each half of an ARF475FL. The 0° splitters and 4:1 transformers are made on small binocular cores (Fair-Rite #2843002402) using two turns of bifilar-wound #28 enameled wire. The ferrite core material is suitable for use to > 60 MHz. Above that, type 61 ferrite material should be used.