

## Introduction

The power amplifier and transmit mixer were constructed and analyzed.

## 1 Power Amplifier

### 1.1 Receiver Switch

Before building the power amplifier itself, a receiver switch was installed in order to protect the receiver circuitry for when the transmitter will be active. The schematic of the protective switch is shown in Figure 1.1.

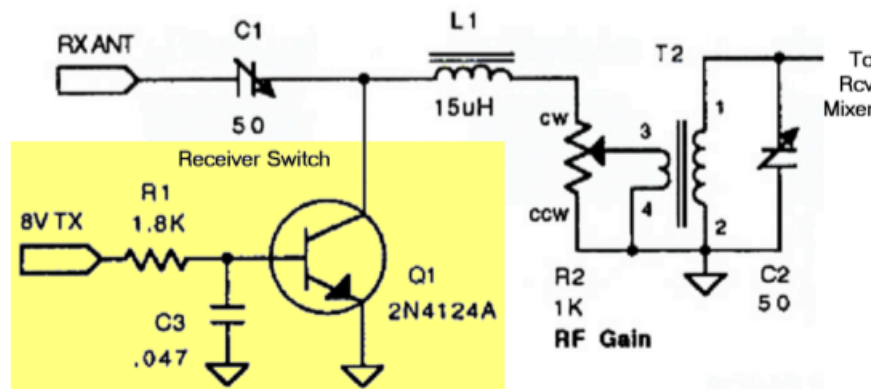


Figure 1: Receiver Switch

After the installation of the switching circuitry, the power amplifier was then build according to the schematic shown in Figure 1.1.

### 1.2 Measurements and Analysis

In order to prevent cooking the oscilloscope prematurely, a 40dB attenuator was connected between the antenna terminal and the coaxial cable. After this, the function generator was connected across  $R_{14}$  and set initially to  $1V_{pp}$  at  $7.04MHz$ .

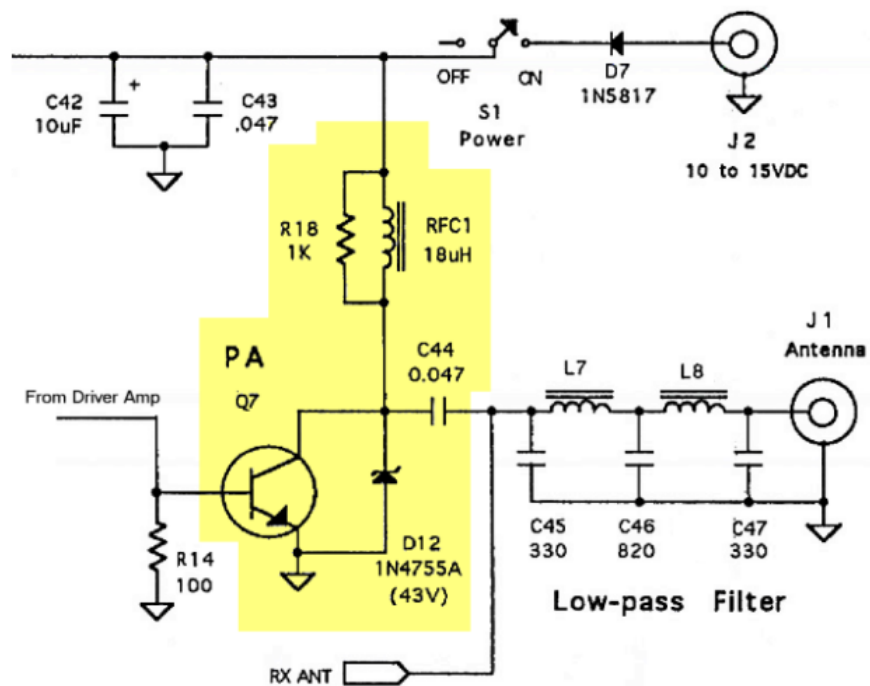


Figure 2: Power Amplifier

The following conditions were noted:

$$\begin{aligned}
 \text{Input Voltage} &\equiv V_0[V_{pp}] \\
 \text{Output Voltage} &\equiv V[V_{pp}] \\
 \text{Supplied Current} &\equiv i_0[mA] \\
 \text{Supplied Power} &\equiv P_0[mW] \\
 \text{Output Power} &\equiv P[mW] \\
 \text{Gain} &\equiv G \\
 \text{Efficiency} &\equiv \eta
 \end{aligned}$$

The measurable values are  $V_0$ ,  $V$ , and  $i_0$ . The remaining values were calculated using the

following equations:

$$\text{Let } R_L = 50\Omega; V_{DC} = 12V$$

$$P_0 = V_{DC} \cdot i_0$$

$$P = \frac{V^2}{16 \cdot R_L}$$

$$\eta = \frac{P}{P_0}$$

$$G = 20 \log \left( \frac{V}{V_0} \right)$$

### 1.3 Plotting $\eta$ v.s. $P$

In Figure 1.3, the efficiency  $\eta$  is plotted against the output power  $P$ . In Figure 1.3, the gain of the power amplifier was plotted against the input RF Voltage.

Figure 3: Plot of Efficiency  $\eta$  v.s. Output Power  $P$

Figure 4: Plot of Gain v.s. input RF Voltage

## 2 Transmit Mixer

Next, the Transmit Mixer was build and tested. Its schematic is shown in the following Figure.

### 2.1 Initial Set of Measurements

All components except  $C_{31}$  were soldered. Next,  $C_{34}$  was adjusted to get a max voltage level at  $\boxed{V}$ . Next, the resonant frequency was measured across the crystal and inductor and found to be  $\square$

After these final measurements,  $C_{31}$  was soldered in.

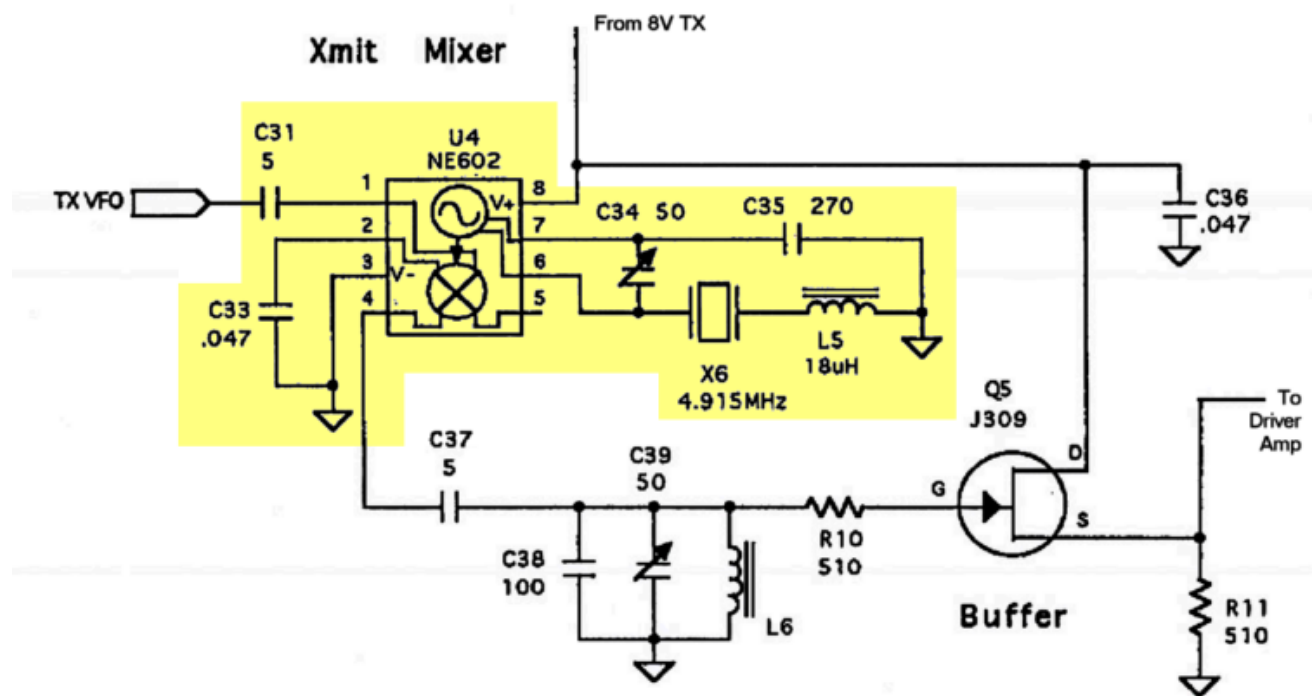


Figure 5: Transmitter Mixer