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TTT4212 RF/Microwave Design and Measurement Techniques

Term Project Fall 2014

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1 Introduction

This report serves as the documentation of the work done in conjunction with the term project done in the course TTT4212 RF/Microwave design and measurement techniques. The goal of the project is to design an RF power amplifier using a single active device, the Cree CHG40010 GaN transistor, to simulate the performance parameters of the amplifier using the Keysight ADS software suite, and to verify the performance of the amplifier by building it and performing the required measurements.

2 Design of circuit

2.1 DC Bias point

We are using ADS to simulate the I-V characteristics of the CGH40010 transistor. ADS is providing a built-in design guide for this purpose. Figure 2.1 shows the I-V characteristics, with drain current on the y-axis, drain voltage on the x-axis and curves for various gate voltages from -5 to -1 volts in 0.2 volts increments. Refering to figure 5.12 in [1, p. 200], we choose to set a bias point at approximately 70% of the maximum saturated drain current IDS, to achieve a compromise between good linearity and high gain. We find this to be a gate voltage of about -1 volts.

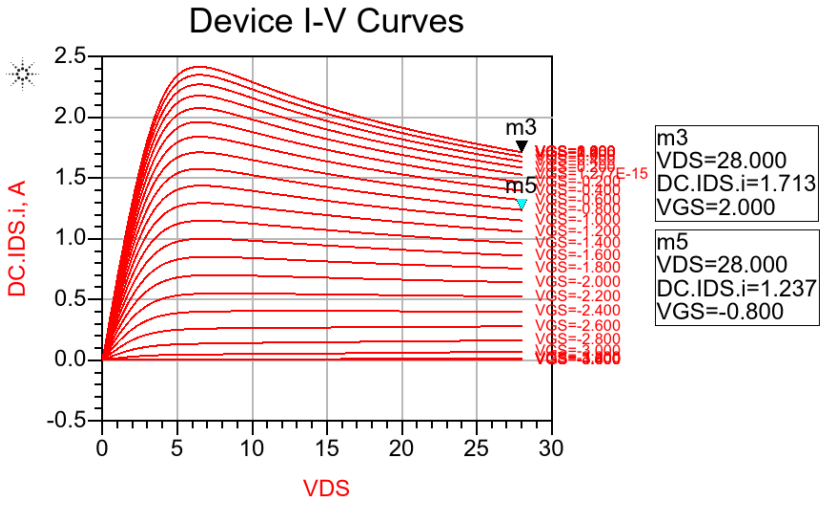

Figure 2.1: I-V curve characteristics for CGH40010

2.2 Bias network

2.3 Power supply filtering

2.4 Matching network

3 Circuit Simulation

3.1 DC Bias point simulation

3.2 Linear S-parameter simulations

3.3 Nonlinear Harmonic balance simulation

4 Real-World Measurements

4.1 Gain

4.2 Power output

4.3 Stability

4.4 Linearity

5 Bibliography

[1] I.D. Robertson, *RFIC and MMIC Design and Technology*. The Institution of Engineering and Technology, 2nd edition, 2001