

**James Cook University**  
**Electrical and Computer Engineering**  
**EE4306 RF Design Assignment**

***Aim***

The aim of this assignment is to firstly provide some experience in the design and optimisation of RF circuits. This assignment is worth 20% of the total mark for the subject.

***Requirements:***

Design a low noise amplifier using the Avago's ATF-35143 high dynamic range, low noise, PHEMT, which is housed in a 4-lead SC-70 (SOT-343) surface mount plastic package. The input and output are to be compatible with either a 50  $\Omega$  or a 75  $\Omega$  characteristic impedance system, depending on the specifications set for you. A supply voltage of up to 5V is available. The low noise amplifier can be mounted on a FR4 PCB material. For FR4, the board has a thickness of 1.52 mm thickness and is copper plated with a 1 oz copper cladding (0.035mm thick). FR4 has a dielectric constant of approximately 4.7 and a loss tangent of 0.014. FR4 does not have well controlled RF properties.

Your design should include noise figure and output power (such as 1dB compression) determinations for your amplifier. Your design should be unconditionally stable and have as low a noise as possible. The bandwidth of the amplifier should be at least the bandwidth specified specifically for you.

The design to be produced by each student should include a full PCB layout and its corresponding Gerber plot file. PCB mounting SMA connectors are to be used for the connectors to get the signals on and off the board. These connectors can be in any suitable configuration, but they must be able to provide a good RF connection and be soldered directly to the board. The circuit is to occupy the smallest possible printed circuit board area.

Each student has to write a report providing full design, layout and optimisation details of the design. The circuit schematic design must be verified using computer simulation. A paper copy of the design report is to be submitted by **10 am Monday 20 October 2008** to A/Prof Kikkert. The Microwave Office and Gerber Plot files are to be Zipped and the Zip file should be submitted using digital drop box in LearnJCU by the same deadline. The report (doc or txt) file is to be submitted using Safe-assign in LearnJCU. The MWO files must have your name and student number as text in the Schematic file. **Safe-assign will detect plagiarism.**

Each student is given a different minimum RF bandwidth and impedance to design for, according to the following table:

Surname	Given Name	Frequency	Impedance
Anderson	Liam James	500-1500	50
Authurs	Wade Jared	600-1600	50
Bajema	Casey William	700-1700	50
Bajema	Grant Jacob	800-1800	50
Brennan	Craig Michael	900-1900	50
Carter	Christopher	1000-2000	50
Daltonalomes	Scott	1100-2100	50
Davis	Owen Stephen	1200-2200	50
De Jager	Jean-Pierre	500-1500	75
Evans	Adrian James	600-1600	75
McNicol	James Douglas Tang	700-1700	75
Meerkotter	Monique	800-1800	75
Nash	Matthew Richard	900-1900	75
Olsen	Natalie Susan	1000-2000	75
Payet	Selwyn Allen	1100-2100	75
Rees	Matthew Bernard	1200-2200	75
Xie	Rong	750-1750	50

The marking scheme is on the next page and that page must be attached to your assignment, to permit the appropriate feedback.

C. J. Kikkert  
15 Sep 2008

## ***RF Assignment Marking Scheme***

6 marks will be given for documentation outlining the operation of the circuit.

Your documentation should include all the circuit diagrams, and screen shots of the performance of the circuit.

8 marks will be given for the RF design i.e. the performance of the amplifier.

These marks will include the following performance indicators:

- 1 How well does the circuit work as an amplifier ?
- 2 What is the noise figure, 1 dB compression point and output power
- 3 How costly is it to manufacture ( size, tolerances required etc) ?
- 4 Are the bandwidth requirements satisfied ?

5 marks will be given for the circuit layout.

Factors to be considered here are the overall size of the circuit, the real estate utilisation, the avoidance of unwanted coupling and the shielding provided by the ground-plane.

1 mark will be given for the Gerber plot files.

**Minus 3 marks will given if the Documentation and Gerber Plot files are not clearly labelled with your name and student number.**

**Name:**

	Max	Mark	Comment
Documentation	6		
RF design	8		
Layout	5		
Plot files	1		
Name in Docs	-3		
Total			