The Impact of System Impedance on the Characterization of High Power Devices

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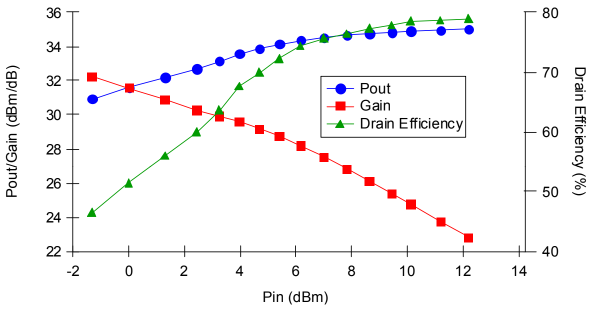
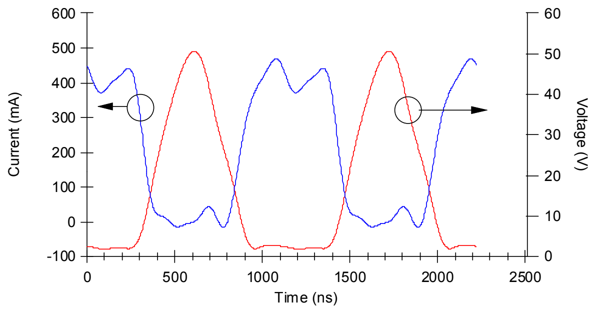
Outline

- Introduction
  - The use of waveforms in PA design
  - Simulation conditions
- The impact of system impedances on high power and low power devices
  - Low power
  - High power
- Possible solutions

Introduction – The Use of Waveforms

- Waveforms allow for improved amplifier design
- This can only be inferred by the use of power meters and spectrum analysers
- The use of waveforms confirms the behaviour of the device

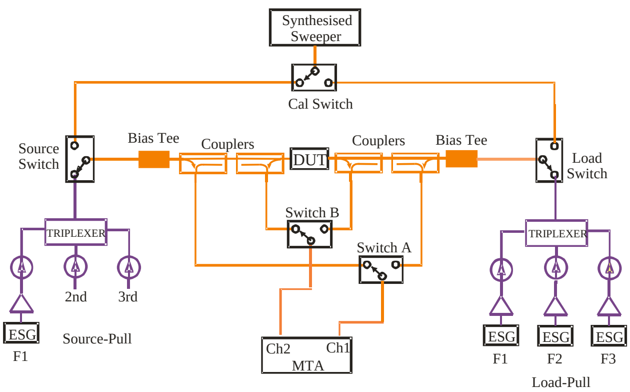




Simulation set up

The simulations are done with consideration of the measurement capabilities available at Cardiff University

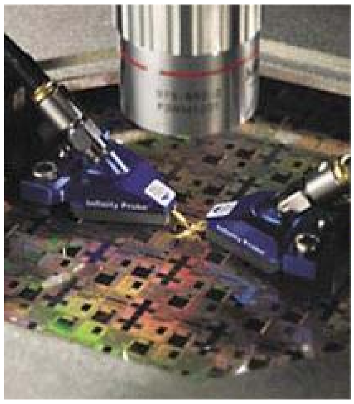
- The DUT is biased at pinch off (class B)
- The DUT is subjected to 3 harmonic active load pull with the system impedance set to 50Ω for all other frequencies
  - Z(f0) = real
  - Z(2f0) = 0Ω
  - Z(3f0) = 0Ω
- The sources are set to 50Ω

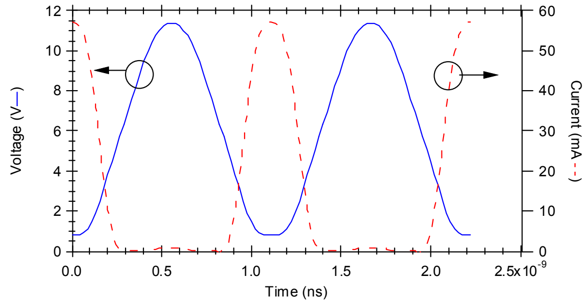


The Impact of System Impedance

Low power On wafer device

- Z(f0) = 250Ω
- Z(2f0) & Z(3f0) set to a short circuit
- Higher harmonics terminated to 50Ω
- Clean waveforms with little visible effect of higher harmonics
- Fourth and fifth harmonics are 35dBc below the fundamental

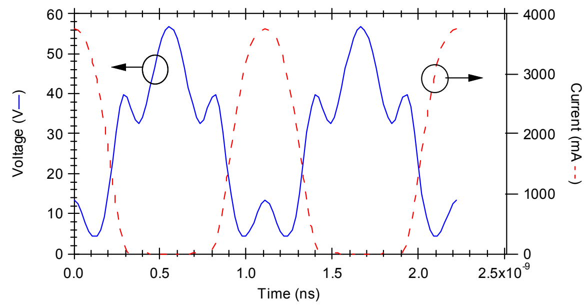


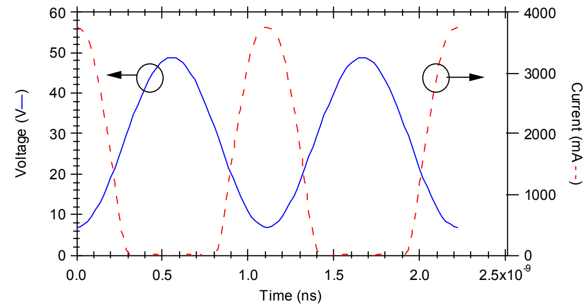


The Impact of System Impedance

High power On wafer device

- Z(f0) = 11Ω
- Z(2f0) & Z(3f0) set to a short circuit
- Higher harmonics terminated to 50Ω
- Heavily distorted voltage waveform
- Fourth harmonic voltage is only 7.8dB below the fundamental
- Device inserted into a 2Ω system environment
- Waveforms have now become a lot cleaner





Possible Solutions

- A low impedance measurement system
- A 5/7/9/n harmonic load pull measurement system
- Broadband impedance transformers