Power_Dissipation_for_FET

Where To Find This Example

Select Help > Open Examples... from the menus and type either the example name listed above or one of the keywords below.

Or in Version 13 or higher you can open the project directly from this page using this button. Make sure to select the Enable Guided Help before clicking this button.

Open Install Example

Design Notes

Power Dissipation Calculation for Schematic Elements

This example shows how to determine the power dissipated as heat in a FET using the Total Power (PT) measurement found in the measurement catalog as well as the TOT_PWRA schematic annotation. This measurement can be used on any schematic component (resistor, transmission line, transistor, PDK element, etc.).

A Curtice3 non-linear FET model is used as the example device with a harmonic balance tuner for optimum output power. The port has a power sweep from 15 to 45 dBm in available power from the source. The variable in the tuning window allows the user to sweep the power and observe the dissipated power in the transistor by hovering the mouse cursor over the transistor.

PowerDissHandCalculations Output Equations

The output equations "PowerDissHandCalculations" compares hand calculations of the power dissipated as heat in the transistor compared with the value calculated directly by the PT measurement. The variable "point" controls the sample point for the calculation, and should be set to the same value as the variable in the tuning window for comparison purposes. Notice how the PAEB measurement is used to calculate PAE in order to match the PT measurement.

DC Power Consumption and Current versus Input Power Graph

The graph of DC power consumption and current shows how the DC supply power and transistor power dissipation varies with input power. As the available power increases, the PAE of the device will peak and therefore decrease the amount of heat dissipated in the transistor, measured by PT. Conversely, the amount of DC current supplied to the transistor (ICOMP) and converted to RF power will increase, as will PCOMP.

Output Power and Efficiency versus Input Power Graph

The graph of output power and efficiency displays the differences between the main measures of efficiency as the input power is increased. The differences are most apparent when the amplifier starts to saturate at higher input power levels. The first efficiency curve (PAEB) is set to calculate the power-added-efficiency over the whole bandwidth, which is equivalent to using PT as the Pout term in the efficiency calculation. The second and third curves (DCRF and PAE) only use the output power of the fundamental frequency, so naturally they will tend to be lower than the PAEB measure, with the DCRF value higher than the PAE value by definition.

Schematic - PowerDiss_FET
Graph - DC Power Consumption and Current versus Input Power

Graph - Output Power and Efficiency versus Input Power