

CMOS090 HIGH FREQUENCY MOS MODELS

High Frequency (HF) models are intended to account for both Non Quasi-Static behavior of the intrinsic MOS transistor channel region and MOS parasitic elements.

1. Principle

A schematics of a HF model is depicted on Figure 1 below. It consists of a sub-circuit including a BSIM4.2.1 compact model instance, surrounded by parasitic element such as resistors or capacitors.

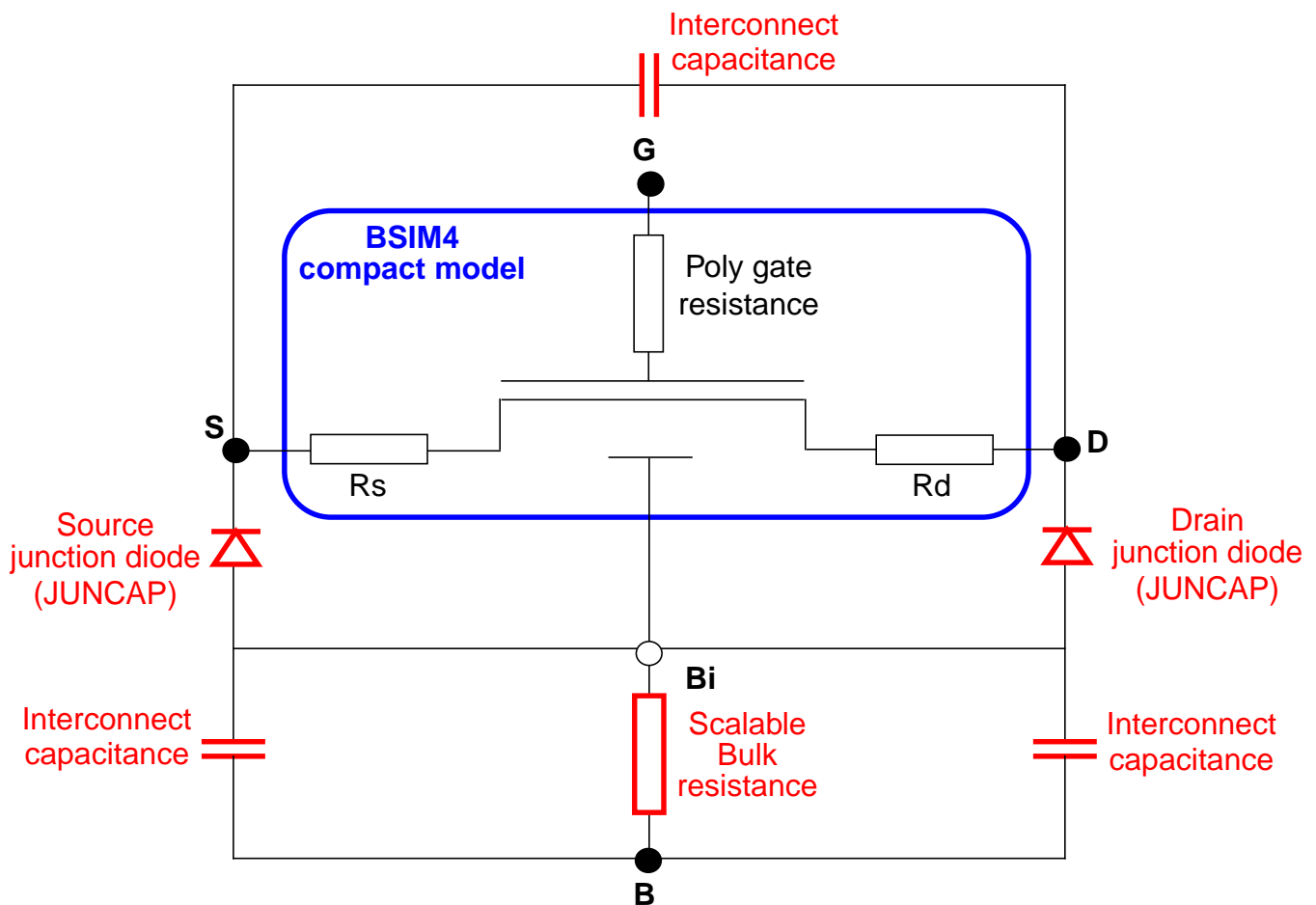


Figure 1: Schematics of a HF model sub-circuit

Parasitic elements are introduced to account for:

- poly gate resistance, which includes contact resistance, silicide sheet resistance and interface silicide/polysilicon resistance;
- substrate (or rather N/Pwell) resistance;
- interconnect capacitances (the ones related to the gate terminal have been included in BSIM4.2.1 model parameters).

All these elements have been computed using layout dimensions of the device PCell.

Non Quasi-Static behavior description relies on BSIM4.2.1 built-in Non Quasi-Static features.

2. Guidelines for use

Non Quasi-Static effects can occur at rather low frequencies and their significance is strongly related to the ratio between the application frequency and the MOS transition frequency (F_t). If this ratio is around 1 or above, Non Quasi-Static HF models should be used.

Parasitic effects are generally significant at frequencies above 1 GHz. They are mandatory to estimate HF figures of merit such as maximum oscillation frequency and noise figure.

3. Nomenclature

High frequency model names are standard model names followed by extension “**rf**”.

Example: **nsvtrf** calls the HF model of a **NMOS SVT** transistor.