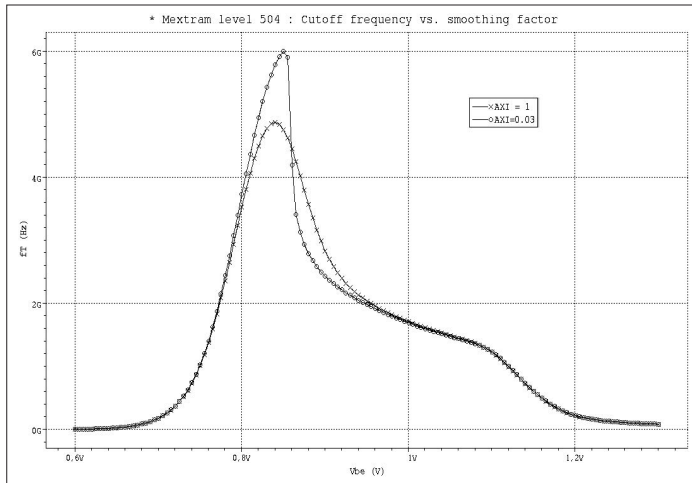


Mextram

GENERAL PURPOSE BIPOLAR MODEL

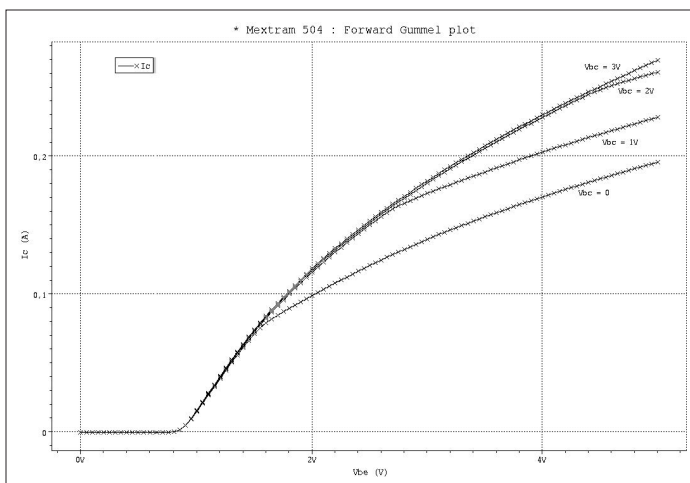


Evolution of cut-off frequency with smoothing parameter AXI.

New Level 504 Improvements

Mextram 504 upgrades the previous 503 version with the following features:

- Includes self-heating, allowing device temperature to be dynamically computed. Self-heating calculations use only analytical derivatives, reducing simulation times (no need to compute numerical derivatives)
- Modeling of SiGe is now possible using a dedicated set of reviewed parameters which makes the extraction procedure easier
- Two constant overlap capacitances have been added
- First and higher order derivatives have been smoothed, resulting in better accuracy and convergence ability



Forward DC characteristics.

Mature Bipolar Model

Mextram provides several features that Gummel-Poon model lacks:

- Bias-dependent Early effect
- High injection effects
- Ohmic resistance of the epilayer
- Velocity saturation effects on the resistance of the epilayer
- Hard and quasi saturation (including Kirk effect)
- Split base-collector and base-emitter depletion capacitance
- Substrate effects and parasitic PNP
- Current crowding and conductivity modulation of the base resistance
- First order approximation of distributed high frequency effects in the intrinsic base (high frequency current crowding and excess-phase shift)
- Recombination in the base (for SiGe transistors)
- Early effect in the case of a graded bandgap (for SiGe transistors)
- Temperature scaling
- Self-Heating

Silvaco Implementation

- Mextram is compatible with VZERO and BYPASS options in order to achieve greater speed performance
- Internal warnings and diagnostics provide valuable information to help find convergence issues
- User-friendly parameters checking: user is kept aware of every clipped parameter
- Device internal variables (currents, conductances, charges...) can easily be accessed like any other parameter
- Mextram model is part of the SmartLib product-independent model library. It can be accessed within SmartSpice as level 503 or 504

Advanced Applications

Mextram's second version is now well suited to high technology:

- Advanced processes such as double poly or even SiGe can be modeled
- Mextram can be used for high-voltage power applications
- Uncommon situations like simulating the NPN device in LDMOS technology behave correctly with Mextram

SILVACO