

Hints, Tips and Solutions

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Q. How can I use the SOI BSIM3_MG routine to extract initial SOI SPICE model parameters.

A. The BSIM3_MG routine in SOI module of *UTMOST* III can be used to extract SOI model parameters. The SOI BSIM3_MG routine operation is similar to the one in MOS module. However the "Measurement Variables" (Figure 1) and biasing of the SOI device is unique.

The SOI devices can have 4 or 5 terminals. For 4 terminal SOI devices typically the bulk node floats and drain, gate, source and backgate terminals are used for biasing. For 5 terminal SOI devices the bulk terminal has a contact too. The number of terminals for the SOI devices can be defined by toggling the "# of Terminals" button in the system screen.

In order to support the combinations of 4 or 5 terminal devices the measurement setup screen of SOI BSIM3_MG routine had to be redesigned. The SOI BSIM3_MG routine can handle stepping of bulk bias while the backgate bias is constant or stepping of backgate bias while bulk bias is constant.

The definition of the "Measurement variables" of SOI BSIM3_MG routine:

- VGS_start_vg: VGS start value for IDS/VGS curves.
- VGS_stop_vg: VGS stop value for IDS/VGS curves.
- VDS_low_vg: VDS constant voltage for (low bias) IDS/VGS curve.
- VDS_high_vg: VDS constant voltage for (high bias) IDS/VGS curve.
- VDS_start_vd: VDS start value for IDS/VDS curves.
- VDS_stop_vd: VDS stop value for IDS/VDS curves.
- VGS_strt1_vd: First VGS step value for IDS/VDS curve where VBS=0V. This value is automatically set by the routine. The value is based on the measured VTH of each device and the "VGS_strt_off" variable : $VGS_strt1_vd = VTH + VGS_strt_off$
- VGS_strt2_vd: First VGS step value for IDS/VDS curve where VBS=Vbulk_vd. This value is automatically set by the routine. The value is based on the measured VTH of each device and the "VGS_strt_off" variable : $VGS_strt2_vd = VTH$ (at VBS=Vbulk_vd) + VGS_strt_off
- VGS_strt_off: Offset voltage used to define VGS_strt1_vd and VGS_strt2_vd.

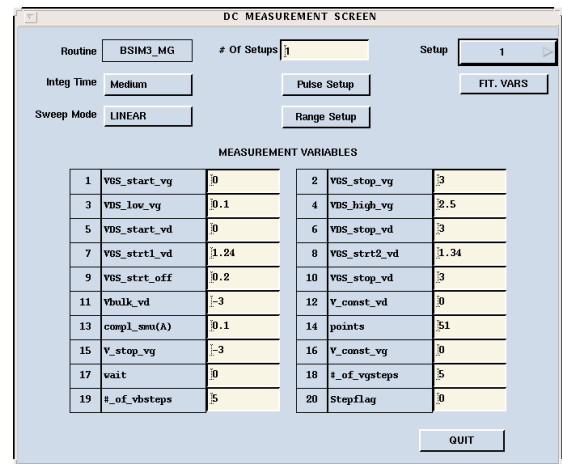


Figure 1. SOI BSIM3_MG routine measurement variables screen.

- VGS_stop_vd: Maximum VGS voltage applied at IDS/VDS curves.
- V_bulk_vd: If the #_of_terminals is set to 4: The voltage applied to backgate for (high bias) IDS/VDS curves.
If the #_of_terminals is set to 5 and if the step_flag is set to 0: The voltage applied to backgate for (high bias) IDS/VDS curves.
If the #_of_terminals is set to 5 and if the step_flag is set to 1: The voltage applied to body for (high bias) IDS/VDS curves.
- V_const_vd: If the #_of_terminals is set to 4: V_const_vd is not used.
If the #_of_terminals is set to 5 and if the step_flag is set to 0: The voltage applied to body for all (low and high bias) IDS/VDS curves.
If the #_of_terminals is set to 5 and if the step_flag is set to 1: The voltage applied to backgate for all (low and high bias) IDS/VDS curves.
- compl_smu(A): Compliance current for all SMUs.
- points: Number of points for each voltage sweep.
- V_stop_vg: If the #_of_terminals is set to 4: The maximum voltage applied to backgate for all IDS/VGS curves.

If the `#_of_terminals` is set to 5 and If the `step_flag` is set to 0: The maximum voltage applied to backgate for all IDS/VGS curves.

If the `#_of_terminals` is set to 5 and If the `step_flag` is set to 1: The maximum voltage applied to body for all IDS/VGS curves.

`V_const_vg`: If the `#_of_terminals` is set to 4: `V_const_vg` is not used.

If the `#_of_terminals` is set to 5 and If the `step_flag` is set to 0: The voltage applied to body for all IDS/VGS curves.

If the `#_of_terminals` is set to 5 and If the `step_flag` is set to 1: The voltage applied to backgate for all IDS/VGS curves.

`wait`: Wait time for each sweep.

`#_of_vgsteps`: Number of VGS steps for IDS/VDS curves.

`#_of_vbsteps`: Number of VBS (bulk) or VBG (backgate) steps for IDS/VGS curves.

`step_flag`: VBS (bulk) or VBG (backgate) stepping flag. If number of terminals is set to 4 then the `step_flag` is not used. The `step_flag` is active only for 5 terminal devices.

The data collection and extraction algorithms of SOI BSIM3_MG is same as MOS BSIM3_MG routine. Related information can be obtained from the MOS Extraction Manual Volume #1.

Call for Questions

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