### **Model Bug Fixes for BSIM3v3.2.3**

- ❖ 1/f noise model bug fix
- Memory pointer bug
- \* ACDE check
- **❖** Temperature parameters for parasitic diodes
- ❖ Typo error for CAPMOD=0,40/60 partition

#### 1/f Noise Model Bug Fix

Requested by David Zweidinger Keith Green Britt Brooks

**Texas Instruments** 

## **Problem:** negative DelClm under certain conditions of voltage bias, temperature, L, and W

$$S_{id,inv}(f) = \frac{k_B T q^2 \mathbf{m}_{eff} I_{ds}}{C_{oxe} L_{eff}^2 A_{bulk} f^{ef} \cdot 10^{10}} \left( NOIAlog \left( \frac{N_0 + N^*}{N_l + N^*} \right) + NOIB \left( N_0 - N_l \right) + \frac{NOIC}{2} \left( N_0^2 - N_l^2 \right) \right)$$

$$+ \frac{k_B T I_{ds}^2 \Delta L}{W_{eff}^2 L_{eff}^2 f^{ef} \cdot 10^{10}} \frac{NOIA + NOIB N_l + NOIC N_l^2}{\left( N_l + N^* \right)^2} \Delta L_{clm} = Litl \cdot log \left( \frac{V_{ds} - V_{dseff}}{Litl} + EM \right)$$

$$+ \frac{C l m}{W_{eff}^2 L_{eff}^2 f^{ef} \cdot 10^{10}} \frac{NOIA + NOIB N_l + NOIC N_l^2}{\left( N_l + N^* \right)^2} \Delta L_{clm} = Litl \cdot log \left( \frac{V_{ds} - V_{dseff}}{E_{sat}} + EM \right)$$

$$+ \frac{E_{sat}}{m_{eff}}$$

$$+ \frac{2VSAT}{m_{eff}}$$

$$+ \frac{1}{m_{eff}} \frac{$$

DelClm = pParam->BSIM3lit1 \* log (MAX(T0, N\_MINLOG));

## **Memory Pointer Bug**

Requested by David Zweidinger Keith Green Britt Brooks

**Texas Instruments** 

Problem: No value assignment to pParam for no-binning approach.

#### In b3temp:

```
while ((pSizeDependParamKnot != NULL) && Size_Not_Found)
{    if ((here->BSIM31 == pSizeDependParamKnot->Length)
        && (here->BSIM3w == pSizeDependParamKnot->Width)
        && (here->BSIM3nf == pSizeDependParamKnot->NFinger))
{        Size_Not_Found = 0;
        here->pParam = pSizeDependParamKnot;
        pParam = here->pParam; /*bug-fix */
    }
}
```

## ACDE (capMod 3) Checking

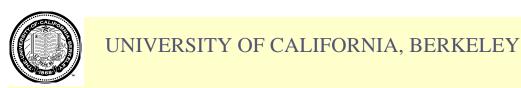
Requested by David Zweidinger Keith Green Britt Brooks

**Texas Instruments** 

#### **Problem:** warning message for other capacitance models

#### In b3check.c:

```
if(model->BSIM3capMod ==3) {
    if (pParam->BSIM3acde < 0.4)
    {       fprintf(fplog, "Warning: Acde = %g is too small.\n", pParam->BSIM3acde);
            printf("Warning: Acde = %g is too small.\n", pParam->BSIM3acde);
    }
    if (pParam->BSIM3acde > 1.6)
    {       fprintf(fplog, "Warning: Acde = %g is too large.\n", pParam->BSIM3acde);
            printf("Warning: Acde = %g is too large.\n", pParam->BSIM3acde);
            printf("Warning: Acde = %g is too large.\n", pParam->BSIM3acde);
        }
}
```



# Temperature Parameters for Parasitic Diodes

Requested by Alex Zavorine Circuit Semantics

Jane Xi UC Berkeley

Problems: Model parameters be reassigned with new value for parasitic diode parameters in b3temp.c

In bsim3def.h, new Pre-calculated constants added:

double BSIM3unitAreaTempJctCap;

double BSIM3unitLengthSidewallTempJctCap;

double BSIM3unitLengthGateSidewallTempJctCap;

Modifications also needed in bsim3def.h, b3temp.c, b3ld.c.

#### Typo Error for CapMod0 in BSIM3

Requested by: Alex Zavorine Circuit Semantics

Jane Xi UC Berkeley

Problem: A fundamental bug propagated from BSIM3 for

CAPMOD=0, 40/60 partition:

In b3ld.c:

here->BSIM3cbdb = -(here->BSIM3cgdb + here->BSIM3cddb + T10);

/\* replace from T11 \*/