

ECE HSPICE NOTES:

Use **Xming** & **ece3.ece.arizona.edu**

Commands to run Hspice:

```
>hspice xxx.sp >! xxx.lis &  
>wv
```

Output File Types for WaveView Analyzer

.ac – AC analysis

.sw – DC analysis

.tr – Transient Analysis

Commands to run Cadence: (must have Xming fonts)

1. *Copy the cdsinit and cds.lib to your own account*

```
>cp /opt/ncsu-cdk-beta/cdssetup/cdsinit .cdsinit
```

```
>cp /opt/ncsu-cdk-beta/cdssetup/cds.lib cds.lib
```

2. *Using cadence to draw layout.*

```
>virtuoso
```

MOSIS WAFER ACCEPTANCE TESTS

RUN: T76M (7RF_8LM)
 BURLINGTON
 TECHNOLOGY: SCN018
 microns

VENDOR: IBM-
 FEATURE SIZE: 0.18

Run type: SKD

INTRODUCTION: This report contains the lot average results obtained by MOSIS from measurements of MOSIS test structures on each wafer of this fabrication lot. SPICE parameters obtained from similar measurements on a selected wafer are also attached.

COMMENTS: 7RF_IBM-BURLIN

TRANSISTOR PARAMETERS	W/L	N-CHANNEL	P-CHANNEL	UNITS
MINIMUM Vth	0.24/0.18	0.45	-0.42	volts
SHORT Idss	20.0/0.18	548	-269	uA/um
Vth		0.49	-0.44	volts
Vpt		5.8	-5.4	volts
WIDE Ids0	20.0/0.18	53.3	-76.6	pA/um
LARGE Vth	20.0/20.0	0.36	-0.42	volts
Vjbkd		3.7	-4.0	volts
Ijlk		<50.0	<50.0	pA
K' (Uo*Cox/2)		157.4	-32.9	uA/V^2
Low-field Mobility		410.24	85.75	cm^2/V*s

PROCESS PARAMETERS	N+	P+	M8	POLY	P+PLY	M1	M2
Sheet Resistance	6.3	6.0	0.01	6.2	252.8	0.07	0.09
Contact Resistance	7.6	7.3	10.85	6.8			2.08
Gate Oxide Thickness	45						

ohms/sq
ohms
angstrom

PROCESS PARAMETERS	M3	M4	M5	N+BLK	P+BLK	M6	RP	POLY_NON	M7
TaN UNITS									
Sheet Resistance	0.10	0.10	0.09	71.9	107.0	0.00	162.1	1603.0	0.01
60.8 ohms/sq									
Contact Resistance	4.08	6.31				3.37			
ohms									

COMMENTS: BLK is silicide block.

CAPACITANCE PARAMETERS	N+	P+	POLY	D_N_W	R_W	N_W
UNITS						
Area (substrate)	861	1168		356		207
aF/um ²						
Area (N+active)			7667			
aF/um ²						
Area (P+active)			7345			
aF/um ²						
Area (r well)	945					
aF/um ²						
Area (d well)					1319	
aF/um ²						
Area (N+ HA varactor)		2678				
aF/um ²						
Fringe (substrate)	221	109				
aF/um						
Overlap (N+active)			450			
aF/um						
Overlap (P+active)			592			
aF/um						

CIRCUIT PARAMETERS			UNITS
Inverters	K		
Vinv	1.0	0.77	volts
Vinv	1.5	0.82	volts
Vol (100 uA)	2.0	0.01	volts
Voh (100 uA)	2.0	1.78	volts
Vinv	2.0	0.86	volts
Gain	2.0	-17.64	
Ring Oscillator Freq.			
D1024_THK (31-stg,3.3V)		223.44	MHz
DIV512 (31-stg,1.8V)		441.10	MHz
Ring Oscillator Power			
D1024_THK (31-stg,3.3V)		0.08	uW/MHz/gate
DIV512 (31-stg,1.8V)		0.02	uW/MHz/gate

COMMENTS: DEEP_SUBMICRON

T76M SPICE BSIM3 VERSION 3.1 PARAMETERS

SPICE 3f5 Level 8, Star-HSPICE Level 49, UTMOST Level 8

* DATE: Aug 27/07

* LOT: T76M

WAF: 1003

* Temperature_parameters=Default

```
.MODEL CMOSN NMOS (
+VERSION = 3.1          TNOM    = 27          TOX      = 4.5E-9
+XJ      = 1E-7         NCH    = 2.3549E17      VTH0     = 0.3010441
+K1      = 0.4643788    K2     = -1.643666E-3   K3       = 1E-3
+K3B     = 6.2047426    W0     = 1E-7          NLX      = 2.261558E-
7
+DVT0W   = 0           DVT1W  = 0           DVT2W   = 0
+DVT0    = 0.4531984   DVT1   = 0.2970885    DVT2     = -0.4395191
+U0      = 270.8740493 UA      = -1.55488E-9    UB       = 2.785526E-
18
+UC      = 4.935392E-11 VSAT    = 1.394116E5    A0       = 1.6511568
+AGS     = 0.3421579   B0     = 4.079327E-7    B1       = 5E-6
+KETA    = -0.0156949  A1     = 2.375188E-5    A2       = 0.4885837
+RDSW    = 150         PRWG   = 0.2102567    PRWB     = -0.2
+WR      = 1           WINT   = 1.687207E-9   LINT     = 1.282548E-
8
+DWG     = 4.687843E-9 DWB     = 1.923792E-8   VOFF     = -0.0868462
+NFACTOR = 2.0194109   CIT     = 0           CDSC     = 2.4E-4
+CDSCD   = 0           CDSCB  = 0           ETA0     = 5.681509E-
3
+ETAB    = -5.501207E-5 DSUB    = 0.0202127    PCLM     = 1.5978699
+PDIBLC1 = 0.7528557  PDIBLC2 = 5.431756E-3   PDIBLCB  = -0.1
+DROUT   = 1           PSCBE1 = 4.981597E9     PSCBE2   = 5E-10
+PVAG    = 9.957078E-3 DELTA   = 0.01         RSH      = 6.3
+MOBMOD  = 1           PRT     = 0           UTE      = -1.5
+KT1     = -0.11       KT1L   = 0           KT2      = 0.022
+UA1     = 4.31E-9     UB1    = -7.61E-18    UC1      = -5.6E-11
+AT      = 3.3E4       WL     = 0           WLN      = 1
+WW      = 0           WWN    = 1           WWL      = 0
+LL      = 0           LLN    = 1           LW       = 0
+LWN     = 1           LWL    = 0           CAPMOD   = 2
+XPART   = 0.5         CGDO   = 4.5E-10      CGSO     = 4.5E-10
+CGBO    = 1E-12      CJ     = 8.13584E-4    PB       = 0.8
+MJ      = 0.5220669  CJSW   = 1.869068E-10 PBSW     = 0.8
+MJSW    = 0.3577477 CJSWG  = 3.3E-10      PBSWG    = 0.8
+MJSWG   = 0.3577477 CF      = 0           PVTH0    = -
8.864139E-4
+PRDSW   = -5         PK2    = 1.579052E-3   WKETA    = -
5.099088E-4
+LKETA   = 2.613965E-3 PU0     = 15.5778079    PUA      = 8.566226E-
11
+PUB     = 0           PVSAT  = 1.136184E3    PETA0    = -1E-4
+PKETA   = -4.722313E-3 )
*
```

```
.MODEL CMOSP PMOS (
+VERSION = 3.1          TNOM    = 27          TOX      = 4.5E-9
+XJ      = 1E-7         NCH    = 4.1589E17      VTH0     = -0.4069814
+K1      = 0.603789    K2     = 2.642617E-3   K3       = 0.0979963
+K3B     = 19.9661289  W0     = 1E-6          NLX      = 2.000713E-
8
```

+DVT0W	= 0	DVT1W	= 0	DVT2W	= 0
+DVT0	= 1.091863	DVT1	= 0.8757682	DVT2	= -0.3
+U0	= 117.3470434	UA	= 1.539634E-9	UB	= 2.063611E-
21					
+UC	= -1E-10	VSAT	= 1.710404E5	A0	= 1.1909372
+AGS	= 0.3047929	B0	= 1.784046E-6	B1	= 5E-6
+KETA	= 0.0145862	A1	= 0.3899859	A2	= 0.3
+RDSW	= 616.4413743	PRWG	= 7.401754E-3	PRWB	= -0.5
+WR	= 1	WINT	= 0	LINT	= 2.691903E-
8					
+DWG	= -3.97764E-8	DWB	= -1.298521E-8	VOFF	= -0.1331188
+NFACTOR	= 1.2014944	CIT	= 0	CDSC	= 2.4E-4
+CDSCD	= 0	CDSCB	= 0	ETA0	= 7.739735E-
5					
+ETAB	= -1.320818E-3	DSUB	= 1.227272E-3	PCLM	= 0.9
+PDIBLC1	= 1.085054E-4	PDIBLC2	= 0.013803	PDIBLCB	= 0.1
+DROUT	= 1.098794E-3	PSCBE1	= 1.622979E10	PSCBE2	= 5.267132E-
9					
+PVAG	= 0.0142988	DELTA	= 0.01	RSH	= 6
+MOBMOD	= 1	PRT	= 0	UTE	= -1.5
+KT1	= -0.11	KT1L	= 0	KT2	= 0.022
+UA1	= 4.31E-9	UB1	= -7.61E-18	UC1	= -5.6E-11
+AT	= 3.3E4	WL	= 0	WLN	= 1
+WW	= 0	WWN	= 1	WWL	= 0
+LL	= 0	LLN	= 1	LW	= 0
+LWN	= 1	LWL	= 0	CAPMOD	= 2
+XPART	= 0.5	CGDO	= 5.92E-10	CGSO	= 5.92E-10
+CGBO	= 1E-12	CJ	= 1.165977E-3	PB	= 0.8214639
+MJ	= 0.4256548	CJSW	= 1.220056E-10	PBSW	= 0.8261235
+MJSW	= 0.1032654	CJSWG	= 4.22E-10	PBSWG	= 0.8261235
+MJSWG	= 0.1032654	CF	= 0	PVTH0	= 1.628834E-
3					
+PRDSW	= -5	PK2	= 2.890127E-4	WKETA	= 0.0351583
+LKETA	= -0.0170131	PU0	= 0.1020668	PUA	= 4.750652E-
11					
+PUB	= 0	PVSAT	= 50	PETA0	= 1E-4
+PKETA	= -2.865819E-3)			
*					