UNIVERSITY OF SOUTHERN CALIFORNIA

INFORMATION SCIENCES INSTITUTE

4676 Admiralty Way Suite 1001
Marina del Rey, California 90292-6695
213/822-1511

(Serchip 1.0)

John Poulton
Dept of Computer Science
New West Hall 035A
University of North Carolina
Chapel Hill, NC 27514

Dear M51Q Participant:

Enclosed please find 7 packaged chips of your project:

ID: 17609
P-Name: serchip (Serchip 1.0)
Fab ID: M51QBD1

NMOS/MC3
Serializer

Attached is a bonding map for the project. The die substrate, indicated by an "X", is typically connected to pin 1, but may be connected to a different pin or left unconnected. Be sure to check your bonding map.

Attached are the electrical parameters for the run.

The MOSIS group is very much interested in receiving feedback concerning the projects, particularly regarding performance, problems encountered, and if there are problems, what they are (mask, fabrication, bonding, silicon defect, etc.). Please send your REPORT, either via netmail to MOSIS, or via US mail to:

The MOSIS Project
USC/Information Sciences Institute
4676 Admiralty Way, Suite 1001
Marina del Rey, California 90292-6695

Kindly include in your REPORT request the FAB-ID (as the "FAB-ID:" parameter, preceding the "REPORT:" parameter) of your project, so that we will be able to use your report in evaluating the run.

Sincerely,

The MOSIS Project

M51Q//#31-#85
ORGANIZATION SHIPPING ADDRESS:
Henry Fuchs
Dept of Computer Science, New West Hall 035A
University of North Carolina
Chapel Hill, NC 27514

M51Q BURROUGHS / VTI 4u, 4in

12 Wafers probed, Total number of dies: 900

EXECUTIVE SUMMARY

M51Q OVERVIEW

This run was parametrically on target with relatively small sigmas across the lot. Enhancement thresholds were 0.80 V. and depletion thresholds were -3.05 V.; a combination which resultes in K=4 inverter thresholds that are a little low (2.0 V.). Ring oscillator performance was 14.2 MHz.

SPICE Parameters

```
.MODEL NMOSE NMOS LEVEL=2.00000 LD=0.278225U TOX=635.000E-10
+NSUB=5.184705E+14 VTO=0.691854 KP=3.706919E-05 GAMMA=0.439009
+PHI=0.600000 UO=837.599 UEXP=7.435366E-03 UCRIT=10000.0
+DELTA=0.954204 VMAX=100000. XJ=0.886335U LAMBDA=3.202821E-02
+NFS=1.030384E+12 NEFF=1.001000E-02 NSS=0.000000E+00 TPG=1.00000
+RSH=25.4 CGSO=1.6E-10 CGDO=1.6E-10 CGBO=1.7E-10 CJ=1.1E-4
+MJ=0.5 CJSW=5E-10 MJSW=0.33
.MODEL NMOSD NMOS LEVEL=2.00000 LD=0.265162U TOX=635.000E-10
+NSUB=1.000000E+16 VTO=-3.83938 KP=3.418184E-05 GAMMA=0.475780
+PHI=0.600000 UO=900.000 UEXP=1.001000E-03 UCRIT=804753.
+DELTA=1.51343 VMAX=489751. XJ=0.368730U LAMBDA=1.000000E-06
+NFS=4.310000E+12 NEFF=1.001000E-02 NSS=0.000000E+00 TPG=1.00000
+RSH=25.4 CGSO=1.6E-10 CGDO=1.6E-10 CGBO=1.7E-10 CJ=1.1E-4
+MJ=0.5 CJSW=5E-10 MJSW=0.33.
```

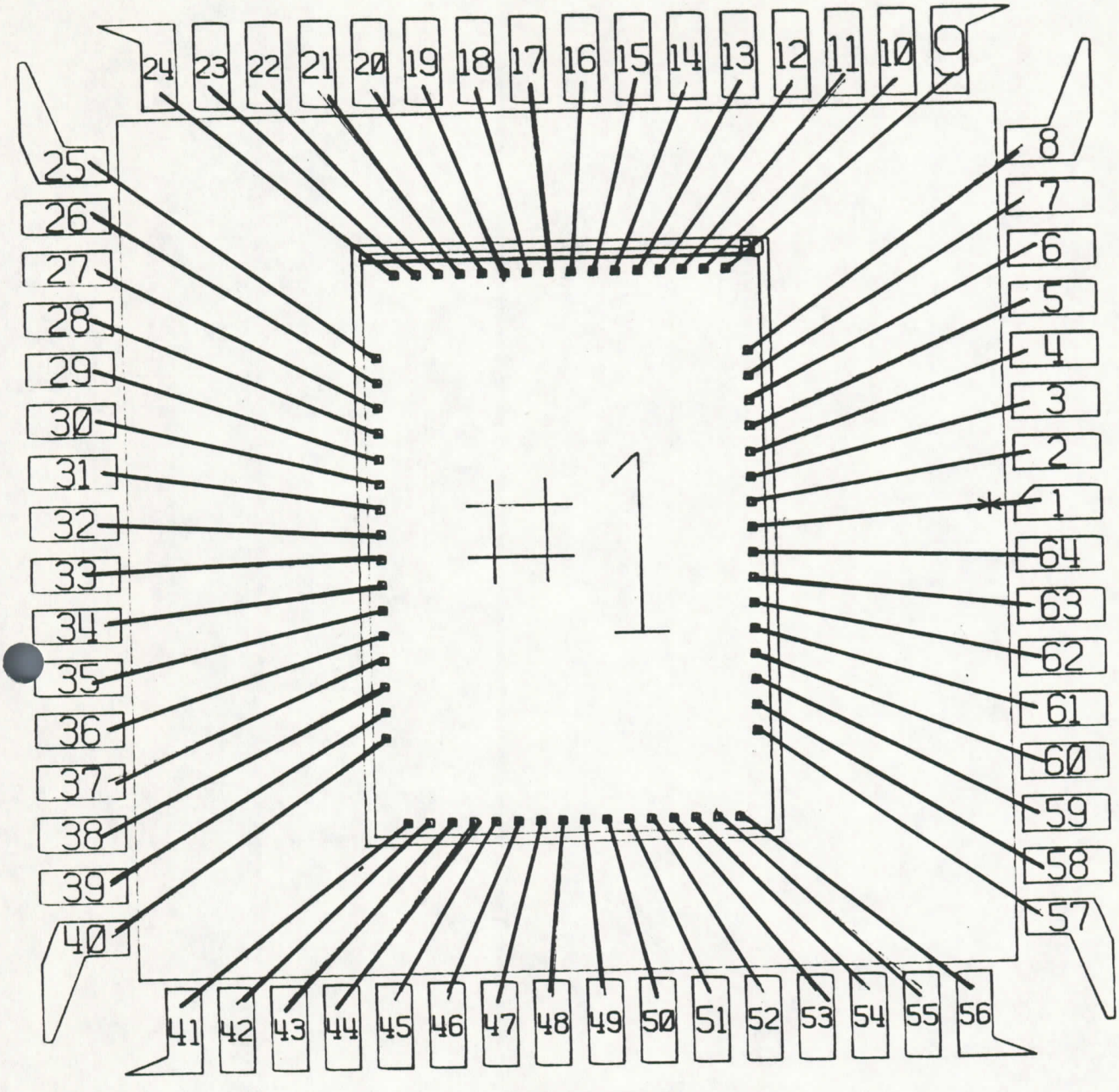
End of Executive Summary

DC PARAMETRIC MEASUREMENTS

Tst	%In_Set	Mean	Sigma	Sig/Mean		
1	97.7	-3.052	0.245	8.02%	V	Vth Dep Length 20u Width 4u
2	98.1	.4132	.0623	15.08%	ua/v	Slope Dep Length 20u Width 4u
3	92.2	42.79	2.27	5.31%	ua/v**2	Kp Dep Length 20u Width 4u
4	96.7	-3.091	0.214	6.92%	V	Vth Dep Length 20u Width 8u
5	98.6	.7697	.1112	14.45%	ua/v	Slope Dep Length 20u Width 8u
6	92.0	39.90	1.58	3.96%	ua/v**2	Kp Dep Length 20u Width 4u
7	96.4	-3.246	0.446	13.73%	V	Vth Dep Length 20u Width 16u
8	95.8	1.425	0.313	21.97%	ua/v	Slope Dep Length 20u Width 16u
9	91.7	36.72	4.92	13.39%	ua/v**2	Kp Dep Length 20u Width 4u
10	98.4	-3.292	0.218	6.61%	V	Vth Dep Length 4u Width 4u
11	93.6	2.625	0.173	6.58%	ua/v	Slope Dep Length 4u Width 4u
12	93.3	52.56	3.19	6.07%	ua/v**2	Kp Dep Length 4u Width 4u
13	92.6	38.45	1.60	4.17%	uA	Ids W4xL20 Dep Vd=5, Vg=0, Vbb= 0.0
14	92.9	26.97	1.48	5.50%	uA	Ids W4xL20 Dep Vd=5, Vg=0, Vbb=-3.5
15	96.6	75.90	9.46	12.47%	uA	Ids W8xL20 Dep Vd=5, Vg=0, Vbb= 0.0
16	96.6	59.35	7.59	12.78%	uA	Ids W8xL20 Dep Vd=5, Vg=0, Vbb=-3.5
17	93.8	237.8	19.8	8.34%	uA	Ids Min Dep Vd=5, Vg=0, Vbb= 0.0
18	94.0	189.0	19.4	10.26%	uA	Ids Min Dep Vd=5, Vg=0, Vbb=-3.5
19	22.1	.1962	2.765		uA	Ids Min DepPas Vd=5, Vs=4, Vg=Vbb=0
20	97.3	39.86	1.82	4.56%	mOhm/sq	Metal Sheet Resisitance
21	99.1	17.76	.1372	0.77%	um	Metal Width Wide (18 um)
22	98.9	11.48	0.24	2.11%	um	Metal Width Split Sum (12 um)
23	99.0	12.02	47.95E-03	0.40%	um	Metal Pitch (12 um)
24	99.1	-.2400	.1376	57.31%	um	Metal Width Wide Error
25	98.9	-.2598	.1211	46.64%	um	Metal Width Narrow Error
26	99.0	19.87E-03	48.02E-03	241.62%	um	Metal Pitch Error
27	93.9	1.572	0.071	4.52%	Ohm	Buried Contact Resistance
28	94.0	-.2462	7.720.		mV	Buried Contact Vsum
29	100.0	1.339	0.358	26.78%	pF	Pad Capacitance (Vbias = - 5V)
30	97.2	.7230	.0201	2.77%	V	Vth Enh Width 20u Length 4u
31	95.4	13.04	0.99	7.59%	ua/v	Slope Enh Length 4u
32	95.0	52.24	3.67	7.03%	ua/v**2	Kp Enh Length 4u
33	97.6	.7648	.0166	2.17%	V	Vth Enh Length 8u
34	95.6	5.446	0.229	4.20%	ua/v	Slope Enh Length 8u
35	97.0	43.31	2.79	6.45%	ua/v**2	Kp Enh Length 8u
36	98.3	.7902	.0186	2.36%	V	Vth Enh Length 16u
37	96.7	2.510	0.105	4.19%	ua/v	Slope Enh Length 16u
38	95.9	40.26	1.27	3.16%	ua/v**2	Kp Enh Length 16u
39	94.9	1.119	0.228	20.36%	u	Delta Length (Enh 8x20u, 16x20u)
40	97.8	-3.921	0.080	2.04%	V	Vth Dep Width 20u Length 4u
41	95.7	9.343	0.698	7.47%	ua/v	Slope Dep Length 4u
42	95.7	37.37	2.79	7.47%	ua/v**2	Kp Dep Length 4u
43	95.0	-3.183	0.117	3.68%	V	Vth Dep Length 8u
44	94.9	5.190	0.310	5.98%	ua/v	Slope Dep Length 8u
45	94.6	41.59	2.19	5.27%	ua/v**2	Kp Dep Length 8u
46	96.4	-3.132	0.171	5.45%	V	Vth Dep Length 16u
47	96.6	2.410	0.213	8.83%	ua/v	Slope Dep Length 16u
48	93.6	39.07	1.91	4.90%	ua/v**2	Kp Dep Length 16u
49	93.3	34.94	19.29	55.22%	nA	Ids L4xW20 Enh Vd=5.0 Vg=0.5 Vbb= 0
50	95.3	1015.	88.	8.64%	uA	Ids L4xW20 Enh Vd=4.0 Vg=4.0 Vbb= 0
51	95.3	893.0	80.5	9.01%	uA	Ids L4xW20 Enh Vd=4.0 Vg=4.0 Vbb=-5
52	95.2	265.1	27.0	10.17%	uA	Ids L4xW20 Enh Vd=0.4 Vg=4.0 Vbb= 0

53	93.8	11.19E-03	89.54E-03	800.04%	uA	Ids L4xW20 Dep Vd=5, Vs=4, Vg=Vbb=0
54	97.6	.8552	.0220	2.58%	V	Vth Enh Length 20u Width 4u
55	95.6	.4419	.0145	3.28%	ua/v	Slope Enh Width 4u
56	95.3	44.21	1.39	3.14%	ua/v**2	Kp Enh Width 4u
57	96.7	.8154	.0168	2.06%	V	Vth Enh Width 8u
58	95.7	.8102	.0202	2.50%	ua/v	Slope Enh Width 8u
59	95.7	40.51	1.01	2.50%	ua/v**2	Kp Enh Width 8u
60	96.9	.8007	.0169	2.12%	V	Vth Enh Width 16u
61	95.7	1.571	0.043	2.73%	ua/v	Slope Enh Width 16u
62	95.7	39.28	1.07	2.73%	ua/v**2	Kp Enh Width 16u
63	97.0	.7618	.0210	2.75%	V	Vth Enh Length 4u Width 4u
64	94.9	2.956	0.152	5.13%	ua/v	Slope Enh Length 4u Width 4u
65	94.9	59.12	3.03	5.13%	ua/v**2	Kp Enh Length 4u Width 4u
66	95.4	-.5161	.1582	30.65%	u	Delta Width (Enh 8x20u, 16x20u)
67	96.4	220.4	17.7	8.03%	uA	Ids Min Enh Vd=4.0, Vg=4.0, Vbb= 0
68	96.6	165.5	14.9	8.99%	uA	Ids Min Enh Vd=4.0, Vg=4.0, Vbb=-5
69	95.3	61.33	4.02	6.55%	uA	Ids Min Enh Vd=0.4, Vg=4.0, Vbb= 0
70	96.6	.8002	.0156	1.94%	V	Vth Large Enh (Vbs = 0)
71	96.0	1.895	0.041	2.14%	ua/v	Slope Large Enh (Vbs = 0)
72	98.2	37.83	0.95	2.51%	ua/v**2	Kp Large Enh (Vbs = 0)
73	96.3	.9572	.0165	1.72%	V	Vth Large Enh (Vbs = -1)
74	98.2	37.33	0.94	2.53%	ua/v**2	Kp Large Enh (Vbs = -1)
75	97.9	.3360	.0094	2.80%	V**-0.5	Gamma Lg Enh (Vbs = 0,-1)
76	96.3	1.201	0.018	1.53%	V	Vth Large Enh (Vbs = -5)
77	98.2	35.83	0.93	2.60%	ua/v**2	Kp Large Enh (Vbs = -5)
78	97.7	.2255	.0035	1.56%	V**-0.5	Gamma Lg Enh (Vbs = -1,-5)
79	96.3	-3.046	0.080	2.62%	V	Vth Large Dep (Vbs = 0)
80	96.3	1.859	0.062	3.34%	ua/v	Slope Large Dep (Vbs = 0)
81	96.2	37.18	1.19	3.21%	ua/v**2	Kp Large Dep (Vbs = 0)
82	96.6	-2.917	0.072	2.47%	V	Vth Large Dep (Vbs = -1)
83	96.7	37.15	1.16	3.13%	ua/v**2	Kp Large Dep (Vbs = -1)
84	94.3	.2824	.0878	31.11%	V**-0.5	Gamma Lg Dep (Vbs = 0,-1)
85	97.3	-2.648	0.071	2.70%	V	Vth Large Dep (Vbs = -5)
86	96.6	37.09	0.98	2.63%	ua/v**2	Kp Large Dep (Vbs = -5)
87	98.4	.2510	.0406	16.18%	V**-0.5	Gamma Lg Dep (Vbs = -1,-5)
88	98.6	4.130	1.746	42.26%	pA	Idss Large Enh
89	99.3	61.05	1.32	2.16%	pF	Gate Capacitor (Vgate = - 5V)
90	99.3	480.5	10.4	2.16%	uF/m**2	Gate Oxide Capacitance
91	99.3	695.9	15.3	2.19%	A	Gate Oxide Thickness
92	97.7	5.723	3.084	53.88%	pA	Gate (Cap) Leak (Vpoly = 10V)
93	95.0	94.31E-03	13.39E-03	14.20%	V	Vout Z Pulsed (K12)
94	97.0	2.112	0.109	5.14%	V	Vinv Pulsed (K12)
95	96.7	1.421	0.045	3.14%	V	Vinv (K12)
96	97.3	-10.85	0.35	3.20%		Gain at Vinv (K12)
97	94.2	.1468	.0196	13.34%	V	Vout Z Pulsed (K8)
98	96.7	1.922	0.099	5.18%	V	Vinv Pulsed (K8)
99	96.2	1.589	0.048	3.04%	V	Vinv (K8)
100	96.3	-8.994	0.254	2.83%		Gain at Vinv (K8)
101	74.6	5.000	0.000	0.00%	V	Vout high (K4)
102	93.2	.2673	.0230	8.61%	V	Vout low (K4)
103	96.6	2.004	0.076	3.78%	V	Vinv (K4)
104	95.8	-5.982	0.246	4.11%		Gain at Vinv (K4)
105	99.2	2.372	0.133	5.62%	Ohm	M/P Contact Resistance (1Ma)
106	98.0	34.24E-03	6.707E-03	19.59%	mV	M/P Contact Vsum (1Ma)
107	99.2	2.386	0.134	5.64%	Ohm	M/P Contact Resistance (10Ma)
108	99.6	.7131	5.662	794.03%	mV	M/P Contact Vsum (10Ma)
109	97.8	14.59	12.44	85.27%	V	V Metalfield Vbs = 0, Id = 1ua
110	56.1	24.55	4.74	19.29%	V	V Metalfield Vbs = -1, Id = 1ua
111	97.3	21.51	0.24	1.11%	V	V Polyfield Vbs = 0, Id = 1ua

112	95.8	24.65	1.07	4.36%	V	V Polyfield Vbs = -1, Id = 1ua
113	92.7	14.77	0.67	4.56%	MHz	Ring Freq 4.0V
114	92.7	14.20	0.66	4.64%	MHz	Ring Freq 5.0V
115	92.7	13.55	0.68	4.99%	MHz	Ring Freq 6.0V
116	98.3	20.84	0.59	2.85%	Ohms/sq	Poly Sheet Resisitance
117	98.6	11.41	0.13	1.17%	um	Poly Width Wide (12 um)
118	99.2	6.798	0.231	3.40%	um	Poly Width Split Sum (8 um)
119	99.0	8.013	70.75E-03	0.88%	um	Poly Pitch (8 um)
120	98.6	-.5905	.1340	22.70%	um	Poly Width Wide Error
121	99.2	-.6012	.1156	19.23%	um	Poly Width Narrow Error
122	99.0	13.04E-03	70.73E-03	542.35%	um	Poly Pitch Error
123	92.0	27.35	4.09	14.94%	Ohm/sq	Diff Sheet Resisitance
124	95.0	15.60	2.79	17.88%	um	Diff Width Wide (14 um)
125	95.0	11.01	4.46	40.50%	um	Diff Width Split Sum (8 um)
126	95.0	10.13	1.40	13.79%	um	Diff Pitch (10 um)
127	95.3	1.691	3.235	191.33%	um	Diff Width Wide Error
128	95.1	1.523	2.303	151.28%	um	Diff Width Narrow Error
129	95.8	.1697	1.551	913.79%	um	Diff Pitch Error
130	92.1	3.128	0.292	9.33%	Ohm	M/D Contact Resistance (1Ma)
131	92.2	33.42E-03	20.06E-03	60.02%	mV	M/D Contact Vsum (1Ma)
132	92.0	3.140	0.282	8.97%	Ohm	M/D Contact Resistance (10Ma)
133	91.6	.5568	.0985	17.69%	mV	M/D Contact Vsum (10Ma)



M51QBD 1

NSF-UNCCHAP-CLASS-CS

#1: 17609\SEARCHIP -- 64P46X68

DIP64: 8 PARTS

MOSIS Integrated Circuit Prototyping Service

PROJECT REPORT

PROJECT ID (like 12345): 17609

FAB ID (like M11XAB2): M510, B01

PROJECT NAME: Serchip

YOUR NAME: eyles YOUR NET ADDRESS:

YOUR ORGANIZATION: unc-ch YOUR PHONE NUMBER: 919-962-7250

SHIPPING:

√ Chips arrived in good condition (7, not 8)

___ Chips were damaged during shipping (please comment below)

PACKAGING:

Overall quality: √ GOOD ___ PROBLEMS (please comment below)

PERFORMANCE:

parts received 7 # parts functional 7

Possible reason for failures (please comment below)

___ mask defect ___ wafer defect ___ packaging ___ design

Speed compared to simulation same - 10 MHz

Performance compared to other fabrications

COMMENTS: LRW 6 Ω/□ + 8 Ω each end

clock rise (10%-90%) ≈ 15 ns approx 50 pf/phase

at 10 MHz average I_{dr} = 20 ma

NO POSTAGE NECESSARY IF MAILED IN THE UNITED STATES

BUSINESS REPLY MAIL

FIRST CLASS PERMIT NO. 778 VENICE, CA

POSTAGE WILL BE PAID BY ADDRESSEE

USC / INFORMATION SCIENCES INSTITUTE
4676 Admiralty Way
Marina del Rey, California 90292-6695

Attn: The MOSIS Project

UNIVERSITY OF SOUTHERN CALIFORNIA

INFORMATION SCIENCES INSTITUTE

4676 Admiralty Way Suite 1001
Marina del Rey, California 90292-6695
213/822-1511

John Poulton
Dept of Computer Science
New West Hall 035A
University of North Carolina
Chapel Hill, NC 27514

Dear M53W Participant:

Enclosed please find 8 packaged chips of your project:

(serchip2.0
5 of 8 worked)

ID: 18132
P-Name: serchip2
Fab ID: M53WEG1

Attached is a bonding map for the project. The die substrate, indicated by an "X", is typically connected to pin 1, but may be connected to a different pin or left unconnected. Be sure to check your bonding map.

Attached are the electrical parameters for the run.

The MOSIS group is very much interested in receiving feedback concerning the projects, particularly regarding performance, problems encountered, and if there are problems, what they are (mask, fabrication, bonding, silicon defect, etc.). Please send your REPORT, either via netmail to MOSIS, or via US mail to:

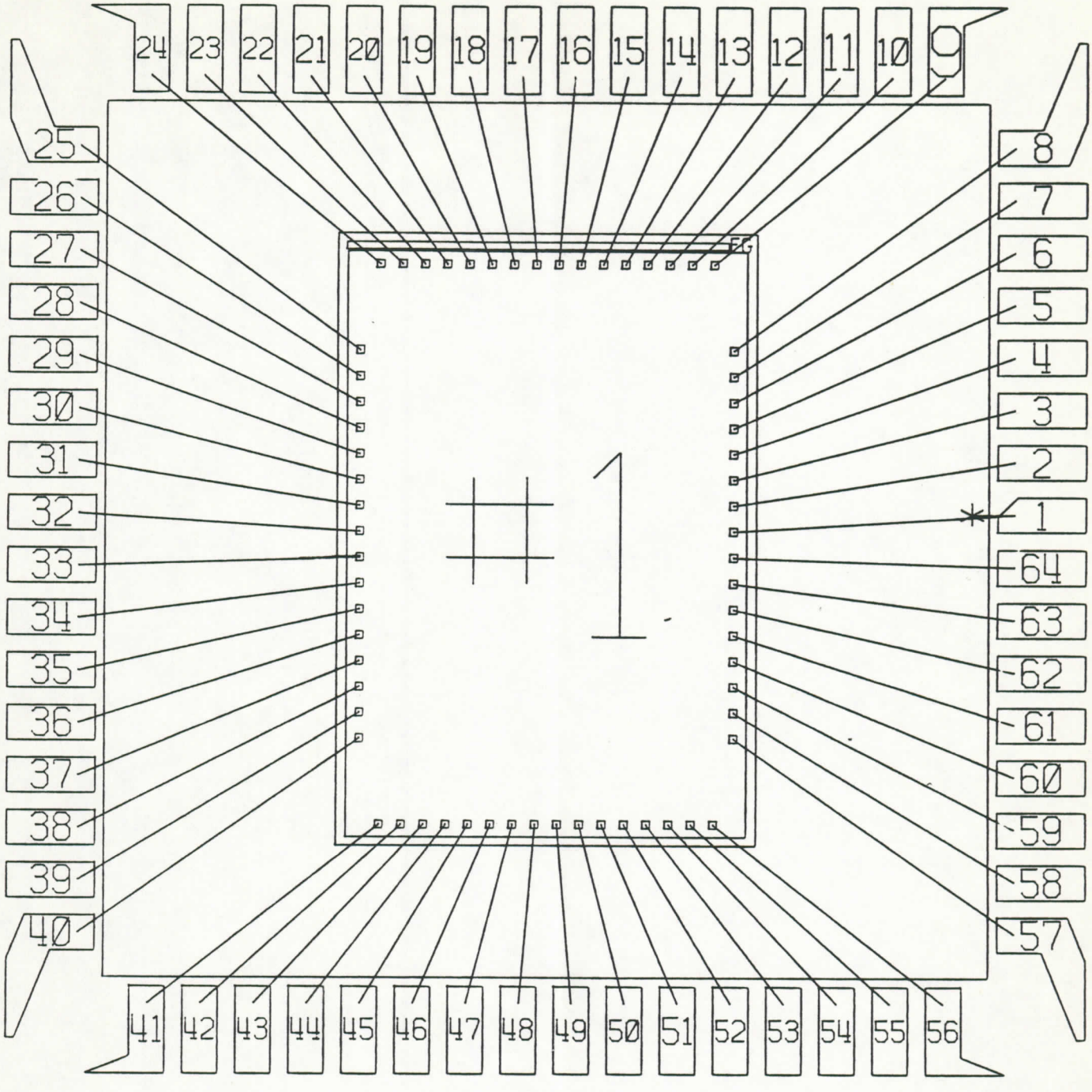
The MOSIS Project
USC/Information Sciences Institute
4676 Admiralty Way, Suite 1001
Marina del Rey, California 90292-6695

Kindly include in your REPORT request the FAB-ID (as the "FAB-ID:" parameter, preceding the "REPORT:" parameter) of your project, so that we will be able to use your report in evaluating the run.

Sincerely,

The MOSIS Project

M53W//#31-#85
ORGANIZATION SHIPPING ADDRESS:
Henry Fuchs
Dept of Computer Science, New West Hall 035A
University of North Carolina
Chapel Hill, NC 27514



M53WEG 1

NSF-UNCCHAP-CLASS-CS

#1: 18132\SERCHIP2 -- 64P46X68

DIP64: 8 PARTS

M53W NMOS 3/4u MICROMASK / COMDIAL

12 Wafers probed, Total number of dies: 612

EXECUTIVE SUMMARY

M53W OVERVIEW

This run was parametrically on target. Transistor thresholds were 0.85 V. (enhancement) and -2.97 V. (depletion). Metal line widths were narrower by about 0.82 um, while other conductors were within 1/3 um of drawn. Ring oscillator performance was 11.6 MHz which is nominal for this technology.

SPICE Parameters

```
.MODEL NMOSE NMOS LEVEL=2.00000 LD=0.315000U TOX=510.000E-10
+NSUB=2.933662E+15 VTO=0.754306 KP=3.270586E-05 GAMMA=0.380236
+PHI=0.600000 UO=675.748 UEXP=1.001000E-03 UCRIT=308843.
+DELTA=1.35443 VMAX=100000. XJ=0.450000U LAMBDA=2.731090E-02
+NFS=1.302458E+12 NEFF=1.001000E-02 NSS=0.000000E+00 TPG=1.00000
+RSH=25.4 CGSO=1.6E-10 CGDO=1.6E-10 CGBO=1.7E-10 CJ=1.1E-4
+MJ=0.5 CJSW=5E-10 MJSW=0.33
.MODEL NMOSD NMOS LEVEL=2.00000 LD=0.315000U TOX=510.000E-10
+NSUB=1.000000E+16 VTO=-3.62800 KP=3.303702E-05 GAMMA=0.386915
+PHI=0.600000 UO=900.000 UEXP=1.001000E-03 UCRIT=804753.
+DELTA=2.71643 VMAX=491072. XJ=0.450000U LAMBDA=1.000000E-06
+NFS=4.310000E+12 NEFF=1.001000E-02 NSS=0.000000E+00 TPG=1.00000
+RSH=25.4 CGSO=1.6E-10 CGDO=1.6E-10 CGBO=1.7E-10 CJ=1.1E-4
+MJ=0.5 CJSW=5E-10 MJSW=0.33
```

END OF EXECUTIVE SUMMARY

DC PARAMETRIC MEASUREMENTS

Tst	%In_Set	Mean	Sigma	Sig/Mean		
1	95.3	-2.938	0.289	9.84%	V	Vth Dep Length 20u Width 4u
2	95.8	.4109	.0342	8.31%	ua/v	Slope Dep Length 20u Width 4u
3	95.8	41.09	3.42	8.31%	ua/v**2	Kp Dep Length 20u Width 4u
4	95.9	-2.935	0.226	7.70%	V	Vth Dep Length 20u Width 8u
5	95.4	.8470	.0509	6.01%	ua/v	Slope Dep Length 20u Width 8u
6	95.4	42.35	2.55	6.01%	ua/v**2	Kp Dep Length 20u Width 4u
7	96.1	-3.107	0.415	13.35%	V	Vth Dep Length 20u Width 16u
8	96.7	1.629	0.189	11.60%	ua/v	Slope Dep Length 20u Width 16u
9	96.7	40.73	4.72	11.60%	ua/v**2	Kp Dep Length 20u Width 4u
10	95.4	-3.144	0.323	10.29%	V	Vth Dep Length 4u Width 4u
11	96.4	2.201	0.244	11.08%	ua/v	Slope Dep Length 4u Width 4u
12	96.4	44.02	4.88	11.08%	ua/v**2	Kp Dep Length 4u Width 4u
13	97.9	36.77	3.03	8.24%	uA	Ids W4xL20 Dep Vd=5, Vg=0, Vbb= 0.0
14	97.9	25.74	2.45	9.50%	uA	Ids W4xL20 Dep Vd=5, Vg=0, Vbb=-3.5
15	98.0	81.02	6.41	7.91%	uA	Ids W8xL20 Dep Vd=5, Vg=0, Vbb= 0.0
16	98.0	62.16	5.60	9.02%	uA	Ids W8xL20 Dep Vd=5, Vg=0, Vbb=-3.5
17	95.6	199.4	17.4	8.74%	uA	Ids Min Dep Vd=5, Vg=0, Vbb= 0.0
18	97.1	154.8	16.6	10.71%	uA	Ids Min Dep Vd=5, Vg=0, Vbb=-3.5
19	61.3	7.027E-03	33.78E-03	480.76%	uA	Ids Min DepPas Vd=5, Vs=4, Vg=Vbb=0
20	99.8	28.63	0.99	3.46%	mOhm/sq	Metal Sheet Resistance
21	99.5	17.18	0.19	1.13%	um	Metal Width Wide (18 um)
22	99.7	10.26	0.40	3.86%	um	Metal Width Split Sum (12 um)
23	99.0	12.05	42.67E-03	0.35%	um	Metal Pitch (12 um)
24	99.5	-.8205	.1946	23.72%	um	Metal Width Wide Error
25	99.7	-.8695	.1980	22.77%	um	Metal Width Narrow Error
26	99.0	51.05E-03	42.92E-03	84.07%	um	Metal Pitch Error
27	96.6	1.767	0.121	6.84%	Ohm	Buried Contact Resistance
28	96.6	12.93E-03	68.94E-03	533.12%	mV	Buried Contact Vsum
29	100.0	1.397	0.366	26.18%	pF	Pad Capacitance (Vbias = - 5V)
30	99.0	.8169	.0287	3.51%	V	Vth Enh Width 20u Length 4u
31	99.2	12.67	1.02	8.08%	ua/v	Slope Enh Length 4u
32	99.2	50.68	4.10	8.08%	ua/v**2	Kp Enh Length 4u
33	98.5	.8464	.0281	3.32%	V	Vth Enh Length 8u
34	99.2	5.624	0.203	3.62%	ua/v	Slope Enh Length 8u
35	99.2	44.99	1.63	3.62%	ua/v**2	Kp Enh Length 8u
36	98.4	.8598	.0263	3.05%	V	Vth Enh Length 16u
37	99.0	2.662	0.059	2.23%	ua/v	Slope Enh Length 16u
38	99.0	42.58	0.95	2.23%	ua/v**2	Kp Enh Length 16u
39	99.2	.8009	.2603	32.51%	u	Delta Length (Enh 8x20u, 16x20u)
40	97.2	-3.257	0.371	11.40%	V	Vth Dep Width 20u Length 4u
41	97.4	11.49	1.40	12.18%	ua/v	Slope Dep Length 4u
42	97.4	45.96	5.60	12.18%	ua/v**2	Kp Dep Length 4u
43	96.9	-3.096	0.284	9.17%	V	Vth Dep Length 8u
44	96.2	5.530	0.485	8.78%	ua/v	Slope Dep Length 8u
45	96.2	44.24	3.88	8.78%	ua/v**2	Kp Dep Length 8u
46	95.9	-2.988	0.226	7.55%	V	Vth Dep Length 16u
47	96.1	2.712	0.185	6.81%	ua/v	Slope Dep Length 16u
48	96.1	43.39	2.95	6.81%	ua/v**2	Kp Dep Length 16u
49	97.7	8.258	1.762	21.34%	nA	Ids L4xW20 Enh Vd=5.0 Vg=0.5 Vbb= 0
50	97.5	944.0	67.8	7.19%	uA	Ids L4xW20 Enh Vd=4.0 Vg=4.0 Vbb= 0
51	98.0	782.0	66.1	8.45%	uA	Ids L4xW20 Enh Vd=4.0 Vg=4.0 Vbb=-5
52	96.9	255.2	19.2	7.51%	uA	Ids L4xW20 Enh Vd=0.4 Vg=4.0 Vbb= 0
53	96.2	.2854	.8741	306.29%	uA	Ids L4xW20 Dep Vd=5, Vs=4, Vg=Vbb=0
54	99.2	.9187	.0304	3.31%	V	Vth Enh Length 20u Width 4u

55	98.9	.4006	.0146	3.63%	ua/v	Slope Enh Width 4u
56	98.9	40.06	1.46	3.64%	ua/v**2	Kp Enh Width 4u
57	98.4	.8774	.0259	2.95%	V	Vth Enh Width 8u
58	97.5	.8078	.0181	2.24%	ua/v	Slope Enh Width 8u
59	97.5	40.39	0.91	2.24%	ua/v**2	Kp Enh Width 8u
60	97.9	.8640	.0261	3.02%	V	Vth Enh Width 16u
61	96.9	1.650	0.035	2.14%	ua/v	Slope Enh Width 16u
62	96.9	41.25	0.88	2.14%	ua/v**2	Kp Enh Width 16u
63	98.5	.8652	.0269	3.11%	V	Vth Enh Length 4u Width 4u
64	98.2	2.332	0.187	8.02%	ua/v	Slope Enh Length 4u Width 4u
65	98.2	46.64	3.74	8.02%	ua/v**2	Kp Enh Length 4u Width 4u
66	96.9	.3247	.1448	44.59%	u	Delta Width (Enh 8x20u, 16x20u)
67	98.2	170.3	13.9	8.18%	uA	Ids Min Enh Vd=4.0, Vg=4.0, Vbb= 0
68	98.2	121.2	11.1	9.14%	uA	Ids Min Enh Vd=4.0, Vg=4.0, Vbb=-5
69	97.7	47.82	4.05	8.47%	uA	Ids Min Enh Vd=0.4, Vg=4.0, Vbb= 0
70	98.9	.8574	.0258	3.01%	V	Vth Large Enh (Vbs = 0)
71	98.7	2.080	0.035	1.70%	ua/v	Slope Large Enh (Vbs = 0)
72	98.7	41.60	0.71	1.70%	ua/v**2	Kp Large Enh (Vbs = 0)
73	98.9	1.075	0.033	3.04%	V	Vth Large Enh (Vbs = -1)
74	98.7	40.96	0.69	1.69%	ua/v**2	Kp Large Enh (Vbs = -1)
75	98.9	.4649	.0182	3.91%	V**-0.5	Gamma Lg Enh (Vbs = 0,-1)
76	98.9	1.416	0.035	2.44%	V	Vth Large Enh (Vbs = -5)
77	98.7	39.19	0.68	1.74%	ua/v**2	Kp Large Enh (Vbs = -5)
78	99.2	.3147	.0101	3.21%	V**-0.5	Gamma Lg Enh (Vbs = -1,-5)
79	95.8	-2.966	0.238	8.01%	V	Vth Large Dep (Vbs = 0)
80	95.8	2.138	0.141	6.60%	ua/v	Slope Large Dep (Vbs = 0)
81	95.8	42.75	2.82	6.60%	ua/v**2	Kp Large Dep (Vbs = 0)
82	95.4	-2.780	0.156	5.60%	V	Vth Large Dep (Vbs = -1)
83	95.4	43.14	1.60	3.70%	ua/v**2	Kp Large Dep (Vbs = -1)
84	80.4	.3462	.1049	30.30%	V**-0.5	Gamma Lg Dep (Vbs = 0,-1)
85	98.2	-2.441	0.115	4.72%	V	Vth Large Dep (Vbs = -5)
86	96.7	43.17	0.95	2.21%	ua/v**2	Kp Large Dep (Vbs = -5)
87	91.2	.3047	.0494	16.21%	V**-0.5	Gamma Lg Dep (Vbs = -1,-5)
88	99.0	7.251	1.858	25.62%	pA	Idss Large Enh
89	98.2	83.29	1.53	1.84%	pF	Gate Capacitor (Vgate = - 5V)
90	98.2	655.6	12.1	1.84%	uF/m**2	Gate Oxide Capacitance
91	98.4	510.1	10.2	1.99%	A	Gate Oxide Thickness
92	98.0	7.527	0.672	8.92%	pA	Gate (Cap) Leak (Vpoly = 10V)
93	96.6	.1216	.0145	11.93%	V	Vout Z Pulsed (K12)
94	97.2	2.489	0.103	4.13%	V	Vinv Pulsed (K12)
95	98.0	1.599	0.055	3.44%	V	Vinv (K12)
96	98.0	-11.99	0.58	4.84%		Gain at Vinv (K12)
97	96.4	.1898	.0232	12.22%	V	Vout Z Pulsed (K8)
98	97.5	2.264	0.109	4.81%	V	Vinv Pulsed (K8)
99	97.9	1.782	0.065	3.63%	V	Vinv (K8)
100	97.7	-9.526	0.565	5.93%		Gain at Vinv (K8)
101	89.5	5.000	1.336E-03	0.03%	V	Vout high (K4)
102	98.9	.3169	.0389	12.28%	V	Vout low (K4)
103	97.7	2.205	0.093	4.23%	V	Vinv (K4)
104	98.2	-5.862	0.572	9.75%		Gain at Vinv (K4)
105	97.7	1.404	0.158	11.26%	Ohm	M/P Contact Resistance (1Ma)
106	97.9	4.800E-03	2.375E-03	49.49%	mV	M/P Contact Vsum (1Ma)
107	97.7	1.420	0.159	11.22%	Ohm	M/P Contact Resistance (10Ma)
108	97.4	.3361	.0311	9.24%	mV	M/P Contact Vsum (10Ma)
109	99.2	24.01	0.95	3.97%	V	V Metalfield Vbs = 0, Id = 1ua
110	97.2	31.63	1.18	3.74%	V	V Metalfield Vbs = -1, Id = 1ua
111	99.3	16.99	0.34	1.97%	V	V Polyfield Vbs = 0, Id = 1ua
112	99.3	25.46	0.52	2.03%	V	V Polyfield Vbs = -1, Id = 1ua
113	96.6	12.11	0.98	8.08%	MHz	Ring Freq 4.0V
114	96.6	11.60	0.93	8.00%	MHz	Ring Freq 5.0V

115	96.7	11.05	0.88	7.93%	MHz	Ring Freq 6.0V
116	99.2	18.39	1.83	9.94%	Ohms/sq	Poly Sheet Resistance
117	99.0	11.74	0.22	1.89%	um	Poly Width Wide (12 um)
118	99.7	7.389	0.429	5.80%	um	Poly Width Split Sum (8 um)
119	98.5	8.038	63.81E-03	0.79%	um	Poly Pitch (8 um)
120	99.0	-.2645	.2223	84.07%	um	Poly Width Wide Error
121	99.7	-.3057	.2144	70.14%	um	Poly Width Narrow Error
122	98.5	37.61E-03	63.97E-03	170.09%	um	Poly Pitch Error
123	94.1	25.52	0.40	1.56%	Ohm/sq	Diff Sheet Resistance
124	95.6	14.34	0.25	1.71%	um	Diff Width Wide (14 um)
125	95.4	8.474	0.348	4.11%	um	Diff Width Split Sum (8 um)
126	96.6	10.09	0.16	1.58%	um	Diff Pitch (10 um)
127	95.6	.3412	.2458	72.04%	um	Diff Width Wide Error
128	95.4	.2371	.1740	73.37%	um	Diff Width Narrow Error
129	96.9	95.46E-03	.1833	192.05%	um	Diff Pitch Error
130	96.4	2.324	2.023	87.08%	Ohm	M/D Contact Resistance (1Ma)
131	97.1	27.03E-03	21.73E-03	80.38%	mV	M/D Contact Vsum (1Ma)
132	94.1	2.141	0.438	20.47%	Ohm	M/D Contact Resistance (10Ma)
133	94.4	.3533	.0876	24.79%	mV	M/D Contact Vsum (10Ma)

End of Run

INFORMATION SCIENCES INSTITUTE

UNIVERSITY OF SOUTHERN CALIFORNIA

4676 Admiralty Way Suite 1001
Marina del Rey, California 90292-6695
213/822-1511

(serchip 2.1
rec'd Jan 21, 1986)

John Poulton
Dept of Computer Science
New West Hall 035A
University of North Carolina
Chapel Hill, NC 27514

Dear M5BF Participant:

Enclosed please find (10) packaged chips of your project:

ID: 18132
P-Name: serchip2
Fab ID: M5BFEG1

Attached is a bonding map for the project. The die substrate, indicated by an "X", is typically connected to pin 1, but may be connected to a different pin or left unconnected. Be sure to check your bonding map.

Attached are the electrical parameters for the run.

The MOSIS group is very much interested in receiving feedback concerning the projects, particularly regarding performance, problems encountered, and if there are problems, what they are (mask, fabrication, bonding, silicon defect, etc.). Please send your REPORT, either via netmail to MOSIS, or via US mail to:

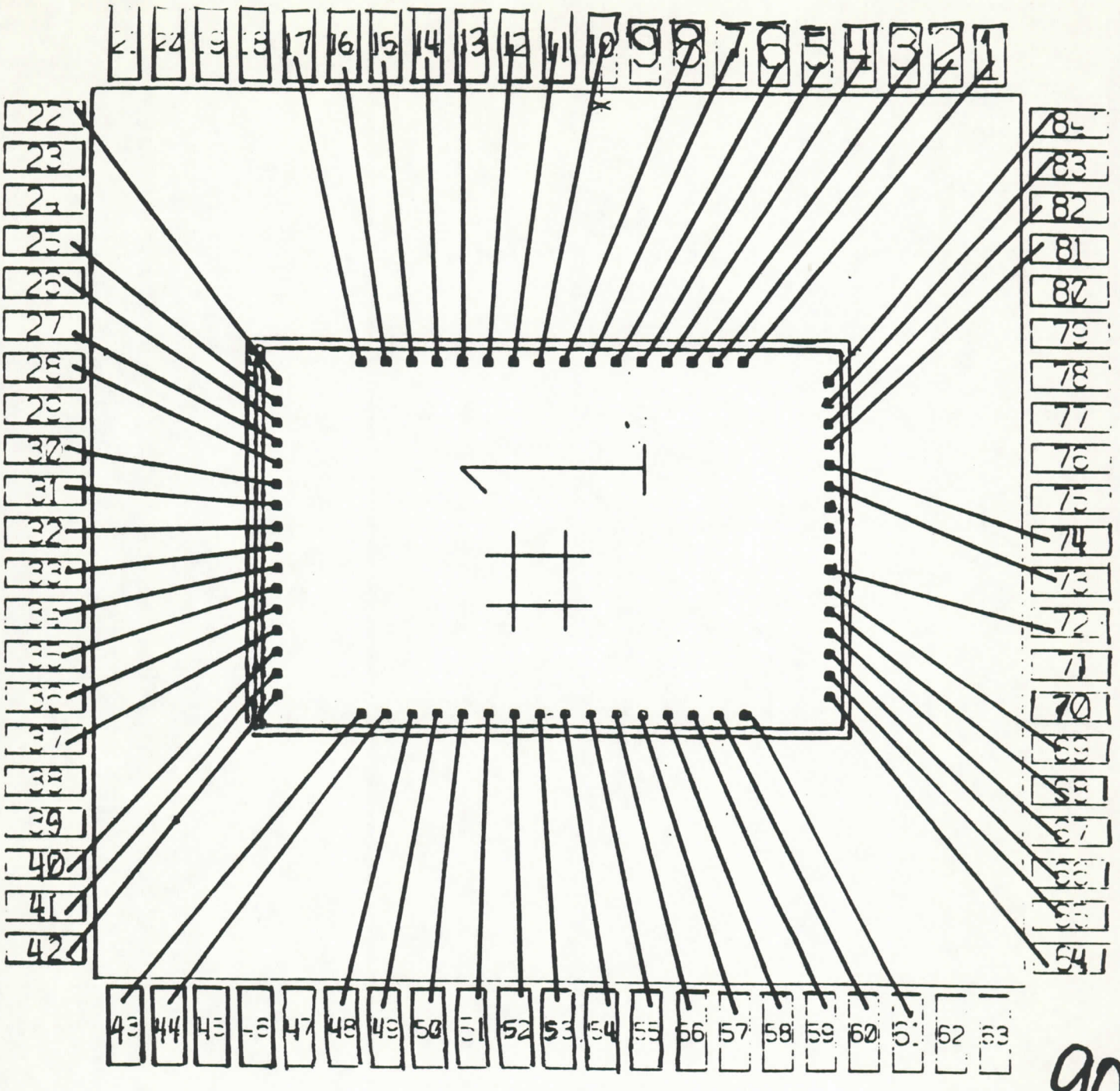
The MOSIS Project
USC/Information Sciences Institute
4676 Admiralty Way, Suite 1001
Marina del Rey, California 90292-6695

Kindly include in your REPORT request the FAB-ID (as the "FAB-ID:" parameter, preceding the "REPORT:" parameter) of your project, so that we will be able to use your report in evaluating the run.

Sincerely,

The MOSIS Project

M5BF//#31-#85
ORGANIZATION SHIPPING ADDRESS:
Henry Fuchs
Dept of Computer Science, New West Hall 035A
University of North Carolina
Chapel Hill, NC 27514



90°

M5BFEG 1

NSF-UNCCHAP-CLASS-CS ROTATE

=1: 19878\3 MICRON SWITCH CHIP

PGA84: 10 PARTS

M5BF/FRITZ NMOS 3/4u Comdial/Pantronix
21 Wafers probed, Total number of dies: 1533

EXECUTIVE SUMMARY

M5BF Overview

This run was in specification parametrically. Ring oscillator frequency was 11.4MHz for the lot. There were a few "unusual" readings in the gate oxide thickness measurements. It is not clear at this time whether there is a problem with the oxide or the instrumentation. Functional devices and individual transistors are working normally on the test strip.

SPICE Parameters

```
.MODEL NMOSE NMOS LEVEL=2.00000 LD=0.315000U TOX=540.000E-10
+NSUB=4.335985E+14 VTO=0.800529 KP=4.412558E-05 GAMMA=0.444692
+PHI=0.600000 UO=300.000 UEXP=5.961160E-03 UCRIT=10000.0
+DELTA=0.666407 VMAX=100000. XJ=0.450000U LAMBDA=1.337973E-02
+NFS=8.146257E+11 NEFF=1.001000E-02 NSS=0.000000E+00 TPG=1.00000
+RSH=25.4 CGSO=1.6E-10 CGDO=1.6E-10 CGBO=1.7E-10 CJ=1.1E-4
+MJ=0.5 CJSW=5E-10 MJSW=0.33
.MODEL NMOSD NMOS LEVEL=2.00000 LD=0.315000U TOX=540.000E-10
+NSUB=1.021211E+15 VTO=-3.40063 KP=4.196735E-05 GAMMA=0.551722
+PHI=0.600000 UO=900.000 UEXP=1.001000E-03 UCRIT=804753.
+DELTA=0.976014 VMAX=421167. XJ=0.450000U LAMBDA=1.000000E-06
+NFS=4.310000E+12 NEFF=1.001000E-02 NSS=0.000000E+00 TPG=1.00000
+RSH=25.4 CGSO=1.6E-10 CGDO=1.6E-10 CGBO=1.7E-10 CJ=1.1E-4
+MJ=0.5 CJSW=5E-10 MJSW=0.33
```

END OF EXECUTIVE SUMMARY

M5BF: 21 Wafers probed, Total number of dies: 1533

DC Parametric Measurements

Tst	%In_Set	Mean	Sigma	Sig/Mean		
1	95.4	-2.737	0.139	5.08%	V	Vth Dep Length 20u Width 4u
2	94.9	.4974	.0220	4.43%	ua/v	Slope Dep Length 20u Width 4u
3	94.8	49.76	2.09	4.20%	ua/v**2	Kp Dep Length 20u Width 4u
4	96.0	-2.761	0.116	4.22%	V	Vth Dep Length 20u Width 8u
5	95.4	.9391	.0309	3.29%	ua/v	Slope Dep Length 20u Width 8u
6	95.4	46.95	1.55	3.29%	ua/v**2	Kp Dep Length 20u Width 4u
7	94.3	-2.837	0.184	6.50%	V	Vth Dep Length 20u Width 16u
8	94.3	1.772	0.104	5.85%	ua/v	Slope Dep Length 20u Width 16u
9	94.1	44.35	2.34	5.27%	ua/v**2	Kp Dep Length 20u Width 4u
10	95.6	-2.903	0.147	5.08%	V	Vth Dep Length 4u Width 4u
11	95.5	2.648	0.221	8.33%	ua/v	Slope Dep Length 4u Width 4u
12	95.5	52.95	4.41	8.33%	ua/v**2	Kp Dep Length 4u Width 4u
13	98.1	39.43	3.46	8.79%	uA	Ids W4xL20 Dep Vd=5, Vg=0, Vbb= 0.0
14	99.0	28.82	3.49	12.12%	uA	Ids W4xL20 Dep Vd=5, Vg=0, Vbb=-3.5
15	98.2	79.57	6.56	8.25%	uA	Ids W8xL20 Dep Vd=5, Vg=0, Vbb= 0.0
16	98.8	62.54	6.64	10.62%	uA	Ids W8xL20 Dep Vd=5, Vg=0, Vbb=-3.5
17	96.8	214.0	21.8	10.20%	uA	Ids Min Dep Vd=5, Vg=0, Vbb= 0.0
18	97.8	170.6	23.4	13.74%	uA	Ids Min Dep Vd=5, Vg=0, Vbb=-3.5
19	66.5	1.225E-03	2.234E-03	182.40%	uA	Ids Min DepPas Vd=5, Vs=4, Vg=Vbb=0
20	97.8	29.92	1.04	3.47%	mOhm/sq	Metal Sheet Resistance
21	99.0	17.48	0.25	1.44%	um	Metal Width Wide (18 um)
22	99.2	10.90	0.88	8.11%	um	Metal Width Split Sum (12 um)
23	98.5	12.03	0.42	3.47%	um	Metal Pitch (12 um)
24	99.0	-.5153	.2523	48.96%	um	Metal Width Wide Error
25	99.2	-.5480	.4421	80.68%	um	Metal Width Narrow Error
26	98.6	33.36E-03	.4175		um	Metal Pitch Error
27	97.7	1.838	0.061	3.33%	Ohm	Buried Contact Resistance
28	97.8	6.225E-03	16.96E-03	272.49%	mV	Buried Contact Vsum
29	100.0	.8959	.2861	31.93%	pF	Pad Capacitance (Vbias = - 5V)
30	99.5	.8187	.0198	2.42%	V	Vth Enh Width 20u Length 4u
31	99.2	12.66	0.97	7.68%	ua/v	Slope Enh Length 4u
32	99.2	50.65	3.89	7.68%	ua/v**2	Kp Enh Length 4u
33	99.5	.8474	.0200	2.36%	V	Vth Enh Length 8u
34	99.3	5.707	0.235	4.11%	ua/v	Slope Enh Length 8u
35	99.3	45.66	1.88	4.11%	ua/v**2	Kp Enh Length 8u
36	98.9	.8594	.0178	2.07%	V	Vth Enh Length 16u
37	98.9	2.725	0.077	2.84%	ua/v	Slope Enh Length 16u
38	98.9	43.60	1.24	2.84%	ua/v**2	Kp Enh Length 16u
39	98.8	.6776	.2340	34.53%	u	Delta Length (Enh 8x20u, 16x20u)
40	97.3	-2.978	0.131	4.40%	V	Vth Dep Width 20u Length 4u
41	98.4	12.05	0.93	7.75%	ua/v	Slope Dep Length 4u
42	98.4	48.20	3.74	7.75%	ua/v**2	Kp Dep Length 4u
43	98.3	-2.866	0.108	3.76%	V	Vth Dep Length 8u
44	98.2	5.831	0.221	3.79%	ua/v	Slope Dep Length 8u
45	98.2	46.65	1.77	3.79%	ua/v**2	Kp Dep Length 8u
46	98.2	-2.807	0.105	3.73%	V	Vth Dep Length 16u
47	98.0	2.853	0.083	2.90%	ua/v	Slope Dep Length 16u
48	98.0	45.65	1.32	2.90%	ua/v**2	Kp Dep Length 16u
49	98.0	14.50	6.26	43.18%	nA	Ids L4xW20 Enh Vd=5.0 Vg=0.5 Vbb= 0

50	99.1	947.1	65.3	6.90%	uA	Ids L4xW20 Enh Vd=4.0 Vg=4.0 Vbb= 0
51	99.2	781.5	63.0	8.06%	uA	Ids L4xW20 Enh Vd=4.0 Vg=4.0 Vbb=-5
52	99.0	255.6	19.1	7.47%	uA	Ids L4xW20 Enh Vd=0.4 Vg=4.0 Vbb= 0
53	96.0	5.995E-03	37.97E-03	633.40%	uA	Ids L4xW20 Dep Vd=5, Vs=4, Vg=Vbb=0
54	99.1	.9142	.0221	2.42%	V	Vth Enh Length 20u Width 4u
55	98.7	.4740	.0172	3.63%	ua/v	Slope Enh Width 4u
56	98.7	47.40	1.72	3.63%	ua/v**2	Kp Enh Width 4u
57	98.7	.8771	.0183	2.08%	V	Vth Enh Width 8u
58	98.8	.8812	.0249	2.83%	ua/v	Slope Enh Width 8u
59	98.8	44.06	1.25	2.83%	ua/v**2	Kp Enh Width 8u
60	98.5	.8636	.0180	2.08%	V	Vth Enh Width 16u
61	98.7	1.717	0.046	2.67%	ua/v	Slope Enh Width 16u
62	98.7	42.92	1.15	2.67%	ua/v**2	Kp Enh Width 16u
63	98.7	.8650	.0189	2.19%	V	Vth Enh Length 4u Width 4u
64	99.1	2.720	0.228	8.37%	ua/v	Slope Enh Length 4u Width 4u
65	99.1	54.40	4.55	8.37%	ua/v**2	Kp Enh Length 4u Width 4u
66	97.8	-.4353	.1190	27.35%	u	Delta Width (Enh 8x20u, 16x20u)
67	99.6	197.9	15.1	7.64%	uA	Ids Min Enh Vd=4.0, Vg=4.0, Vbb= 0
68	99.7	142.0	13.3	9.36%	uA	Ids Min Enh Vd=4.0, Vg=4.0, Vbb=-5
69	99.6	55.62	4.59	8.25%	uA	Ids Min Enh Vd=0.4, Vg=4.0, Vbb= 0
70	70.4	.8560	.0177	2.07%	V	Vth Large Enh (Vbs = 0)
71	70.4	2.084	0.046	2.22%	ua/v	Slope Large Enh (Vbs = 0)
72	99.2	29.61	18.92	63.90%	ua/v**2	Kp Large Enh (Vbs = 0)
73	72.0	1.077	0.023	2.14%	V	Vth Large Enh (Vbs = -1)
74	98.7	29.53	18.34	62.11%	ua/v**2	Kp Large Enh (Vbs = -1)
75	70.2	.4728	.0165	3.49%	V**-0.5	Gamma Lg Enh (Vbs = 0,-1)
76	75.8	1.416	0.071	4.99%	V	Vth Large Enh (Vbs = -5)
77	98.5	29.82	16.32	54.72%	ua/v**2	Kp Large Enh (Vbs = -5)
78	70.7	.3122	.0108	3.46%	V**-0.5	Gamma Lg Enh (Vbs = -1,-5)
79	72.0	-2.794	0.102	3.66%	V	Vth Large Dep (Vbs = 0)
80	71.5	2.189	0.051	2.33%	ua/v	Slope Large Dep (Vbs = 0)
81	71.5	43.79	1.02	2.33%	ua/v**2	Kp Large Dep (Vbs = 0)
82	72.3	-2.641	0.099	3.73%	V	Vth Large Dep (Vbs = -1)
83	71.6	43.75	1.02	2.32%	ua/v**2	Kp Large Dep (Vbs = -1)
84	68.0	.3334	.0847	25.41%	V**-0.5	Gamma Lg Dep (Vbs = 0,-1)
85	73.2	-2.316	0.100	4.32%	V	Vth Large Dep (Vbs = -5)
86	72.9	43.67	1.04	2.38%	ua/v**2	Kp Large Dep (Vbs = -5)
87	71.2	.3035	.0401	13.20%	V**-0.5	Gamma Lg Dep (Vbs = -1,-5)
88	84.3	5.684	2.643	46.50%	pA	Idss Large Enh
89	59.8	74.57	12.07	16.18%	pF	Gate Capacitor (Vgate = - 5V)
90	60.9	582.1	100.8	17.32%	uF/m**2	Gate Oxide Capacitance
91	60.1	593.9	141.0	23.75%	A	Gate Oxide Thickness
92	47.6	5.058	6.482	128.16%	pA	Gate (Cap) Leak (Vpoly = 10V)
93	98.7	.1126	.0112	9.92%	V	Vout Z Pulsed (K12)
94	97.8	2.647	0.424	16.01%	V	Vinv Pulsed (K12)
95	99.3	1.568	0.042	2.70%	V	Vinv (K12)
96	98.8	-12.68	0.40	3.15%		Gain at Vinv (K12)
97	98.8	.1754	.0178	10.17%	V	Vout Z Pulsed (K8)
98	99.2	2.365	0.385	16.28%	V	Vinv Pulsed (K8)
99	99.1	1.741	0.050	2.87%	V	Vinv (K8)
100	98.6	-10.24	0.38	3.72%		Gain at Vinv (K8)
101	99.6	5.000	0.000	0.00%	V	Vout high (K4)
102	98.9	.2967	.0293	9.88%	V	Vout low (K4)
103	99.1	2.176	0.071	3.27%	V	Vinv (K4)
104	98.8	-6.456	0.449	6.95%		Gain at Vinv (K4)
105	98.4	1.439	0.167	11.62%	Ohm	M/P Contact Resistance (1Ma)

106	99.2	4.438E-03	2.306E-03	51.96%	mV	M/P Contact Vsum (1Ma)
107	98.4	1.440	0.169	11.76%	Ohm	M/P Contact Resistance (10Ma)
108	99.1	.2919	.0388	13.30%	mV	M/P Contact Vsum (10Ma)
109	98.8	.3258	2.706	830.64%	V	V Metalfield Vbs = 0, Id = lua
110	1.8	26.54	5.04	19.00%	V	V Metalfield Vbs = -1, Id = lua
111	99.3	15.24	0.32	2.11%	V	V Polyfield Vbs = 0, Id = lua
112	99.4	22.88	0.48	2.10%	V	V Polyfield Vbs = -1, Id = lua
113	98.5	11.86	1.05	8.85%	MHz	Ring Freq 4.0V
114	98.6	11.35	1.01	8.88%	MHz	Ring Freq 5.0V
115	98.5	10.79	0.96	8.92%	MHz	Ring Freq 6.0V
116	97.4	18.41	9.51	51.64%	Ohms/sq	Poly Sheet Resistance
117	99.3	11.68	0.22	1.87%	um	Poly Width Wide (12 um)
118	99.5	7.363	1.500	20.37%	um	Poly Width Split Sum (8 um)
119	98.5	8.018	0.094	1.17%	um	Poly Pitch (8 um)
120	99.3	-.3202	.2189	68.35%	um	Poly Width Wide Error
121	99.5	-.3187	.7500	235.30%	um	Poly Width Narrow Error
122	98.5	17.61E-03	93.86E-03	533.06%	um	Poly Pitch Error
123	96.7	27.55	2.32	8.43%	Ohm/sq	Diff Sheet Resistance
124	97.7	15.03	0.41	2.74%	um	Diff Width Wide (14 um)
125	98.0	9.976	1.141	11.44%	um	Diff Width Split Sum (8 um)
126	97.1	10.05	0.25	2.49%	um	Diff Pitch (10 um)
127	97.7	1.026	0.412	40.15%	um	Diff Width Wide Error
128	98.1	1.002	0.769	76.67%	um	Diff Width Narrow Error
129	97.6	54.26E-03	.3993	735.96%	um	Diff Pitch Error
130	98.4	2.239	0.660	29.46%	Ohm	M/D Contact Resistance (1Ma)
131	98.6	7.420E-03	.5014		mV	M/D Contact Vsum (1Ma)
132	97.3	2.218	0.288	13.00%	Ohm	M/D Contact Resistance (10Ma)
133	97.5	-3.067	4.765	155.34%	mV	M/D Contact Vsum (10Ma)

END OF RUN

PROJECT REPORT

PROJECT ID (like 12345): _____

FAB ID (like M11XAB2): _____

PROJECT NAME: _____

YOUR NAME: _____ YOUR NET ADDRESS: _____

YOUR ORGANIZATION: _____ YOUR PHONE NUMBER: _____

SHIPPING:

_____ Chips arrived in good condition

_____ Chips were damaged during shipping (PLEASE COMMENT BELOW)

PACKAGING:

Overall quality: _____ GOOD _____ PROBLEMS (PLEASE COMMENT BELOW)

PERFORMANCE:

parts received _____ # parts functional _____

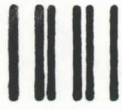
Possible reason for failures (PLEASE COMMENT BELOW)

_____ Mask Defect _____ Wafer Defect _____ Packaging _____ Design

Speed compared to Simulation _____

Performance compared to other fabrications _____

COMMENTS: _____



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UNITED STATES

BUSINESS REPLY MAIL

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USC / INFORMATION SCIENCES INSTITUTE
Attn: The MOSIS Project
4676 Admiralty Way
Marina del Rey, California 90292

UNIVERSITY OF SOUTHERN CALIFORNIA

INFORMATION SCIENCES INSTITUTE

4676 Admiralty Way Suite 1001
Marina del Rey, California 90292-6695
213/822-1511

(serchip 4.0
recd: 21-JAN-86)

John Eyles
Dept of Computer Science
New West Hall 035A
University of North Carolina
Chapel Hill, NC 27514

Dear M5BF Participant:

Enclosed please find 28 packaged chips of your project:

ID: 19650
P-Name: serchip4
Fab ID: M5BFMD1

Attached is a bonding map for the project. The die substrate, indicated by an "X", is typically connected to pin 1, but may be connected to a different pin or left unconnected. Be sure to check your bonding map.

Attached are the electrical parameters for the run.

The MOSIS group is very much interested in receiving feedback concerning the projects, particularly regarding performance, problems encountered, and if there are problems, what they are (mask, fabrication, bonding, silicon defect, etc.). Please send your REPORT, either via netmail to MOSIS, or via US mail to:

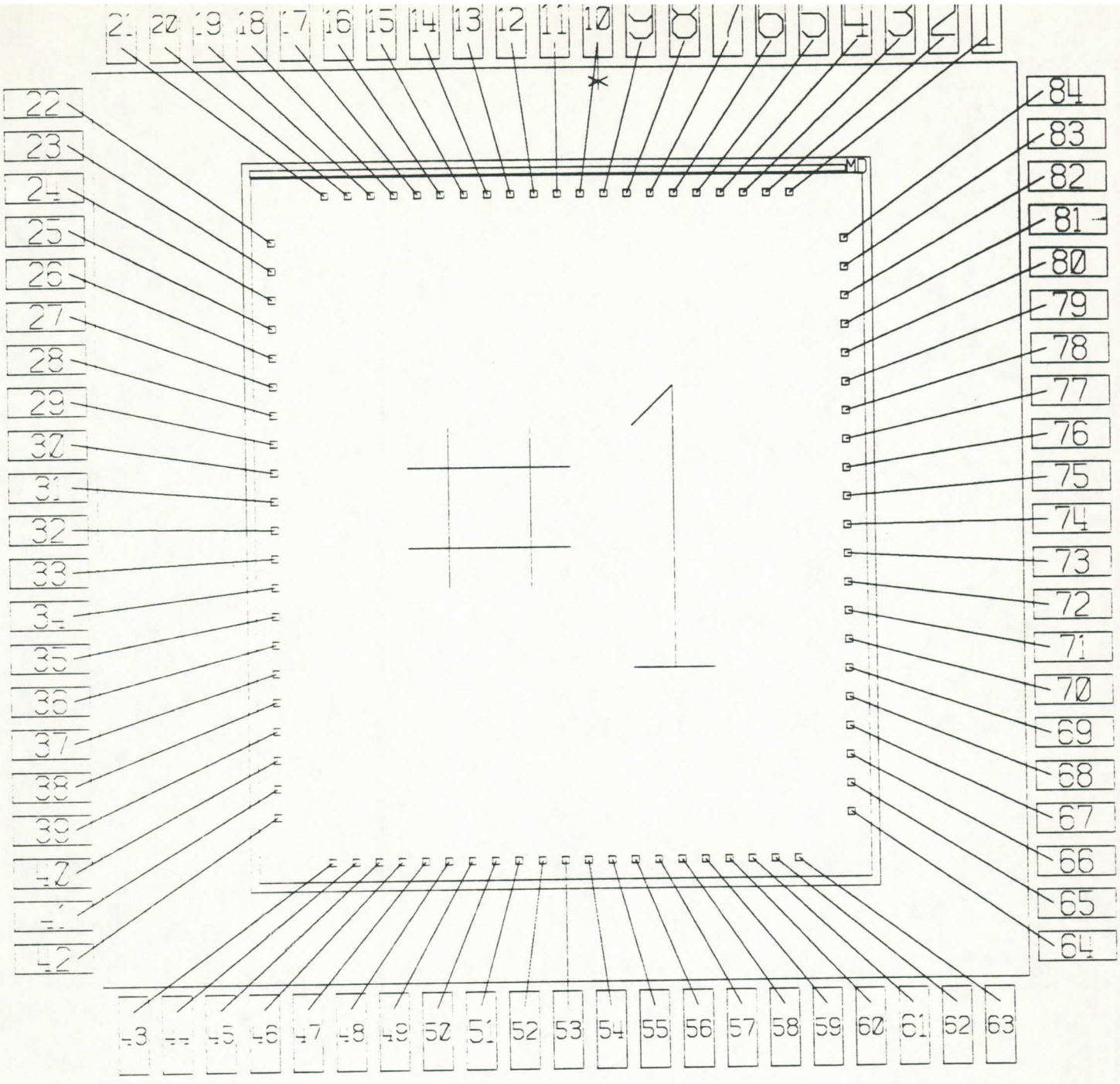
The MOSIS Project
USC/Information Sciences Institute
4676 Admiralty Way, Suite 1001
Marina del Rey, California 90292-6695

Kindly include in your REPORT request the FAB-ID (as the "FAB-ID:" parameter, preceding the "REPORT:" parameter) of your project, so that we will be able to use your report in evaluating the run.

Sincerely,

The MOSIS Project

M5BF//#31-#85
ORGANIZATION SHIPPING ADDRESS:
Henry Fuchs
Dept of Computer Science, New West Hall 035A
University of North Carolina
Chapel Hill, NC 27514



M53FMD 1

NSF-UNCCHAP-CLASS-CS

#1: 19652\SERCHIP4 -- 84P79X92

PGA84: 28 PARTS

M5BF/FRITZ NMOS 3/4u Comdial/Pantronix
21 Wafers probed, Total number of dies: 1533

EXECUTIVE SUMMARY

M5BF Overview

This run was in specification parametrically. Ring oscillator frequency was 11.4MHz for the lot. There were a few "unusual" readings in the gate oxide thickness measurements. It is not clear at this time whether there is a problem with the oxide or the instrumentation. Functional devices and individual transistors are working normally on the test strip.

SPICE Parameters

```
.MODEL NMOSE NMOS LEVEL=2.00000 LD=0.315000U TOX=540.000E-10
+NSUB=4.335985E+14 VTO=0.800529 KP=4.412558E-05 GAMMA=0.444692
+PHI=0.600000 UO=300.000 UEXP=5.961160E-03 UCRIT=10000.0
+DELTA=0.666407 VMAX=100000. XJ=0.450000U LAMBDA=1.337973E-02
+NFS=8.146257E+11 NEFF=1.001000E-02 NSS=0.000000E+00 TPG=1.00000
+RSH=25.4 CGSO=1.6E-10 CGDO=1.6E-10 CGBO=1.7E-10 CJ=1.1E-4
+MJ=0.5 CJSW=5E-10 MJSW=0.33
.MODEL NMOSD NMOS LEVEL=2.00000 LD=0.315000U TOX=540.000E-10
+NSUB=1.021211E+15 VTO=-3.40063 KP=4.196735E-05 GAMMA=0.551722
+PHI=0.600000 UO=900.000 UEXP=1.001000E-03 UCRIT=804753.
+DELTA=0.976014 VMAX=421167. XJ=0.450000U LAMBDA=1.000000E-06
+NFS=4.310000E+12 NEFF=1.001000E-02 NSS=0.000000E+00 TPG=1.00000
+RSH=25.4 CGSO=1.6E-10 CGDO=1.6E-10 CGBO=1.7E-10 CJ=1.1E-4
+MJ=0.5 CJSW=5E-10 MJSW=0.33
```

END OF EXECUTIVE SUMMARY

M5BF: 21 Wafers probed, Total number of dies: 1533

DC Parametric Measurements

Tst	%In_Set	Mean	Sigma	Sig/Mean		
1	95.4	-2.737	0.139	5.08%	V	Vth Dep Length 20u Width 4u
2	94.9	.4974	.0220	4.43%	ua/v	Slope Dep Length 20u Width 4u
3	94.8	49.76	2.09	4.20%	ua/v**2	Kp Dep Length 20u Width 4u
4	96.0	-2.761	0.116	4.22%	V	Vth Dep Length 20u Width 8u
5	95.4	.9391	.0309	3.29%	ua/v	Slope Dep Length 20u Width 8u
6	95.4	46.95	1.55	3.29%	ua/v**2	Kp Dep Length 20u Width 4u
7	94.3	-2.837	0.184	6.50%	V	Vth Dep Length 20u Width 16u
8	94.3	1.772	0.104	5.85%	ua/v	Slope Dep Length 20u Width 16u
9	94.1	44.35	2.34	5.27%	ua/v**2	Kp Dep Length 20u Width 4u
10	95.6	-2.903	0.147	5.08%	V	Vth Dep Length 4u Width 4u
11	95.5	2.648	0.221	8.33%	ua/v	Slope Dep Length 4u Width 4u
12	95.5	52.95	4.41	8.33%	ua/v**2	Kp Dep Length 4u Width 4u
13	98.1	39.43	3.46	8.79%	uA	Ids W4xL20 Dep Vd=5, Vg=0, Vbb= 0.0
14	99.0	28.82	3.49	12.12%	uA	Ids W4xL20 Dep Vd=5, Vg=0, Vbb=-3.5
15	98.2	79.57	6.56	8.25%	uA	Ids W8xL20 Dep Vd=5, Vg=0, Vbb= 0.0
16	98.8	62.54	6.64	10.62%	uA	Ids W8xL20 Dep Vd=5, Vg=0, Vbb=-3.5
17	96.8	214.0	21.8	10.20%	uA	Ids Min Dep Vd=5, Vg=0, Vbb= 0.0
18	97.8	170.6	23.4	13.74%	uA	Ids Min Dep Vd=5, Vg=0, Vbb=-3.5
19	66.5	1.225E-03	2.234E-03	182.40%	uA	Ids Min DepPas Vd=5, Vs=4, Vg=Vbb=0
20	97.8	29.92	1.04	3.47%	mOhm/sq	Metal Sheet Resistance
21	99.0	17.48	0.25	1.44%	um	Metal Width Wide (18 um)
22	99.2	10.90	0.88	8.11%	um	Metal Width Split Sum (12 um)
23	98.5	12.03	0.42	3.47%	um	Metal Pitch (12 um)
24	99.0	-.5153	.2523	48.96%	um	Metal Width Wide Error
25	99.2	-.5480	.4421	80.68%	um	Metal Width Narrow Error
26	98.6	33.36E-03	.4175		um	Metal Pitch Error
27	97.7	1.838	0.061	3.33%	Ohm	Buried Contact Resistance
28	97.8	6.225E-03	16.96E-03	272.49%	mV	Buried Contact Vsum
29	100.0	.8959	.2861	31.93%	pF	Pad Capacitance (Vbias = - 5V)
30	99.5	.8187	.0198	2.42%	V	Vth Enh Width 20u Length 4u
31	99.2	12.66	0.97	7.68%	ua/v	Slope Enh Length 4u
32	99.2	50.65	3.89	7.68%	ua/v**2	Kp Enh Length 4u
33	99.5	.8474	.0200	2.36%	V	Vth Enh Length 8u
34	99.3	5.707	0.235	4.11%	ua/v	Slope Enh Length 8u
35	99.3	45.66	1.88	4.11%	ua/v**2	Kp Enh Length 8u
36	98.9	.8594	.0178	2.07%	V	Vth Enh Length 16u
37	98.9	2.725	0.077	2.84%	ua/v	Slope Enh Length 16u
38	98.9	43.60	1.24	2.84%	ua/v**2	Kp Enh Length 16u
39	98.8	.6776	.2340	34.53%	u	Delta Length (Enh 8x20u, 16x20u)
40	97.3	-2.978	0.131	4.40%	V	Vth Dep Width 20u Length 4u
41	98.4	12.05	0.93	7.75%	ua/v	Slope Dep Length 4u
42	98.4	48.20	3.74	7.75%	ua/v**2	Kp Dep Length 4u
43	98.3	-2.866	0.108	3.76%	V	Vth Dep Length 8u
44	98.2	5.831	0.221	3.79%	ua/v	Slope Dep Length 8u
45	98.2	46.65	1.77	3.79%	ua/v**2	Kp Dep Length 8u
46	98.2	-2.807	0.105	3.73%	V	Vth Dep Length 16u
47	98.0	2.853	0.083	2.90%	ua/v	Slope Dep Length 16u
48	98.0	45.65	1.32	2.90%	ua/v**2	Kp Dep Length 16u
49	98.0	14.50	6.26	43.18%	nA	Ids L4xW20 Enh Vd=5.0 Vg=0.5 Vbb= 0

50	99.1	947.1	65.3	6.90%	uA	Ids L4xW20 Enh Vd=4.0 Vg=4.0 Vbb= 0
51	99.2	781.5	63.0	8.06%	uA	Ids L4xW20 Enh Vd=4.0 Vg=4.0 Vbb=-5
52	99.0	255.6	19.1	7.47%	uA	Ids L4xW20 Enh Vd=0.4 Vg=4.0 Vbb= 0
53	96.0	5.995E-03	37.97E-03	633.40%	uA	Ids L4xW20 Dep Vd=5, Vs=4, Vg=Vbb=0
54	99.1	.9142	.0221	2.42%	V	Vth Enh Length 20u Width 4u
55	98.7	.4740	.0172	3.63%	ua/v	Slope Enh Width 4u
56	98.7	47.40	1.72	3.63%	ua/v**2	Kp Enh Width 4u
57	98.7	.8771	.0183	2.08%	V	Vth Enh Width 8u
58	98.8	.8812	.0249	2.83%	ua/v	Slope Enh Width 8u
59	98.8	44.06	1.25	2.83%	ua/v**2	Kp Enh Width 8u
60	98.5	.8636	.0180	2.08%	V	Vth Enh Width 16u
61	98.7	1.717	0.046	2.67%	ua/v	Slope Enh Width 16u
62	98.7	42.92	1.15	2.67%	ua/v**2	Kp Enh Width 16u
63	98.7	.8650	.0189	2.19%	V	Vth Enh Length 4u Width 4u
64	99.1	2.720	0.228	8.37%	ua/v	Slope Enh Length 4u Width 4u
65	99.1	54.40	4.55	8.37%	ua/v**2	Kp Enh Length 4u Width 4u
66	97.8	-.4353	.1190	27.35%	u	Delta Width (Enh 8x20u, 16x20u)
67	99.6	197.9	15.1	7.64%	uA	Ids Min Enh Vd=4.0, Vg=4.0, Vbb= 0
68	99.7	142.0	13.3	9.36%	uA	Ids Min Enh Vd=4.0, Vg=4.0, Vbb=-5
69	99.6	55.62	4.59	8.25%	uA	Ids Min Enh Vd=0.4, Vg=4.0, Vbb= 0
70	70.4	.8560	.0177	2.07%	V	Vth Large Enh (Vbs = 0)
71	70.4	2.084	0.046	2.22%	ua/v	Slope Large Enh (Vbs = 0)
72	99.2	29.61	18.92	63.90%	ua/v**2	Kp Large Enh (Vbs = 0)
73	72.0	1.077	0.023	2.14%	V	Vth Large Enh (Vbs = -1)
74	98.7	29.53	18.34	62.11%	ua/v**2	Kp Large Enh (Vbs = -1)
75	70.2	.4728	.0165	3.49%	V**-0.5	Gamma Lg Enh (Vbs = 0,-1)
76	75.8	1.416	0.071	4.99%	V	Vth Large Enh (Vbs = -5)
77	98.5	29.82	16.32	54.72%	ua/v**2	Kp Large Enh (Vbs = -5)
78	70.7	.3122	.0108	3.46%	V**-0.5	Gamma Lg Enh (Vbs = -1,-5)
79	72.0	-2.794	0.102	3.66%	V	Vth Large Dep (Vbs = 0)
80	71.5	2.189	0.051	2.33%	ua/v	Slope Large Dep (Vbs = 0)
81	71.5	43.79	1.02	2.33%	ua/v**2	Kp Large Dep (Vbs = 0)
82	72.3	-2.641	0.099	3.73%	V	Vth Large Dep (Vbs = -1)
83	71.6	43.75	1.02	2.32%	ua/v**2	Kp Large Dep (Vbs = -1)
84	68.0	.3334	.0847	25.41%	V**-0.5	Gamma Lg Dep (Vbs = 0,-1)
85	73.2	-2.316	0.100	4.32%	V	Vth Large Dep (Vbs = -5)
86	72.9	43.67	1.04	2.38%	ua/v**2	Kp Large Dep (Vbs = -5)
87	71.2	.3035	.0401	13.20%	V**-0.5	Gamma Lg Dep (Vbs = -1,-5)
88	84.3	5.684	2.643	46.50%	pA	Idss Large Enh
89	59.8	74.57	12.07	16.18%	pF	Gate Capacitor (Vgate = - 5V)
90	60.9	582.1	100.8	17.32%	uF/m**2	Gate Oxide Capacitance
91	60.1	593.9	141.0	23.75%	A	Gate Oxide Thickness
92	47.6	5.058	6.482	128.16%	pA	Gate (Cap) Leak (Vpoly = 10V)
93	98.7	.1126	.0112	9.92%	V	Vout Z Pulsed (K12)
94	97.8	2.647	0.424	16.01%	V	Vinv Pulsed (K12)
95	99.3	1.568	0.042	2.70%	V	Vinv (K12)
96	98.8	-12.68	0.40	3.15%		Gain at Vinv (K12)
97	98.8	.1754	.0178	10.17%	V	Vout Z Pulsed (K8)
98	99.2	2.365	0.385	16.28%	V	Vinv Pulsed (K8)
99	99.1	1.741	0.050	2.87%	V	Vinv (K8)
100	98.6	-10.24	0.38	3.72%		Gain at Vinv (K8)
101	99.6	5.000	0.000	0.00%	V	Vout high (K4)
102	98.9	.2967	.0293	9.88%	V	Vout low (K4)
103	99.1	2.176	0.071	3.27%	V	Vinv (K4)
104	98.8	-6.456	0.449	6.95%		Gain at Vinv (K4)
105	98.4	1.439	0.167	11.62%	Ohm	M/P Contact Resistance (1Ma)

106	99.2	4.438E-03	2.306E-03	51.96%	mV	M/P Contact Vsum (1Ma)
107	98.4	1.440	0.169	11.76%	Ohm	M/P Contact Resistance (10Ma)
108	99.1	.2919	.0388	13.30%	mV	M/P Contact Vsum (10Ma)
109	98.8	.3258	2.706	830.64%	V	V Metalfield Vbs = 0, Id = lua
110	1.8	26.54	5.04	19.00%	V	V Metalfield Vbs = -1, Id = lua
111	99.3	15.24	0.32	2.11%	V	V Polyfield Vbs = 0, Id = lua
112	99.4	22.88	0.48	2.10%	V	V Polyfield Vbs = -1, Id = lua
113	98.5	11.86	1.05	8.85%	MHz	Ring Freq 4.0V
114	98.6	11.35	1.01	8.88%	MHz	Ring Freq 5.0V
115	98.5	10.79	0.96	8.92%	MHz	Ring Freq 6.0V
116	97.4	18.41	9.51	51.64%	Ohms/sq	Poly Sheet Resistance
117	99.3	11.68	0.22	1.87%	um	Poly Width Wide (12 um)
118	99.5	7.363	1.500	20.37%	um	Poly Width Split Sum (8 um)
119	98.5	8.018	0.094	1.17%	um	Poly Pitch (8 um)
120	99.3	-.3202	.2189	68.35%	um	Poly Width Wide Error
121	99.5	-.3187	.7500	235.30%	um	Poly Width Narrow Error
122	98.5	17.61E-03	93.86E-03	533.06%	um	Poly Pitch Error
123	96.7	27.55	2.32	8.43%	Ohm/sq	Diff Sheet Resistance
124	97.7	15.03	0.41	2.74%	um	Diff Width Wide (14 um)
125	98.0	9.976	1.141	11.44%	um	Diff Width Split Sum (8 um)
126	97.1	10.05	0.25	2.49%	um	Diff Pitch (10 um)
127	97.7	1.026	0.412	40.15%	um	Diff Width Wide Error
128	98.1	1.002	0.769	76.67%	um	Diff Width Narrow Error
129	97.6	54.26E-03	.3993	735.96%	um	Diff Pitch Error
130	98.4	2.239	0.660	29.46%	Ohm	M/D Contact Resistance (1Ma)
131	98.6	7.420E-03	.5014		mV	M/D Contact Vsum (1Ma)
132	97.3	2.218	0.288	13.00%	Ohm	M/D Contact Resistance (10Ma)
133	97.5	-3.067	4.765	155.34%	mV	M/D Contact Vsum (10Ma)

END OF RUN

PROJECT REPORT

PROJECT ID (like 12345): _____

FAB ID (like M11XAB2): _____

PROJECT NAME: _____

YOUR NAME: _____ YOUR NET ADDRESS: _____

YOUR ORGANIZATION: _____ YOUR PHONE NUMBER: _____

SHIPPING:

_____ Chips arrived in good condition

_____ Chips were damaged during shipping (PLEASE COMMENT BELOW)

PACKAGING:

Overall quality: _____ GOOD _____ PROBLEMS (PLEASE COMMENT BELOW)

PERFORMANCE:

parts received _____ # parts functional _____

Possible reason for failures (PLEASE COMMENT BELOW)

_____ Mask Defect _____ Wafer Defect _____ Packaging _____ Design

Speed compared to Simulation _____

Performance compared to other fabrications _____

COMMENTS: _____

NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

BUSINESS REPLY MAIL

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POSTAGE WILL BE PAID BY ADDRESSEE

USC / INFORMATION SCIENCES INSTITUTE

Attn: The MOSIS Project

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