

5. Electrical & Process Measurements

This section provides the results of electrical measurements made at the Hewlett-Packard Integrated Circuit Processing Laboratory using the MPC79 starting frame test structures. Included are the ring oscillator frequency as a function of VDD, the various threshold voltages, certain electrical parameters, and basic information about the process, such as oxide thicknesses.

The transit time, τ , of minimum-sized transistors can be derived from this information, and then used by designers to estimate the maximum clock frequencies for their projects. The nineteen-stage ring oscillator "rings" at ~ 17 MHz (at VDD = 5v). Thus the inverter-pair-delay in the oscillator equals 3 ns (see Section 4, Starting Frame Documentation). Let's assume that the effective fanout, f , including parasitics is approximately equal to 2. The inverter-pair-delay $= f(k+1)\tau = 3$ ns. Therefore, we find that the transit time τ is approximately 0.3 ns.



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FROM: Mike Beaver

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TO: MPC 79 Distribution

SUBJECT: MPC 79 Wafer Data

The attached data on the initial two runs for MPC79 represents in-process data from test wafers generated in the normal course of wafer fabrication plus electrical measurements taken on one of the wafers from each lot. This data is enclosed to give you some benchmark data against which you can compare your actual test results. Most of the electrical data was taken with a curve tracer and is subject to appropriate tolerances.

Additionally, wafer to wafer variations exist. If you need more precise data, you can generate it by probing the test devices on the border of each chip.

The follow-on run, from which you may receive additional chips will be similarly characterized. If you have specific questions about the processing, I will attempt to answer them.

Mbe

WAFER DATA

RUN KDEI1
Series A

RUN KDEI2
Series B

Thresholds

Dep	- 4.9	- 4.1
Enh	1.0	0.8
Poly-gate Field	21.0	20.0
Metal-gate Field	21.0	20.0

Resistances

Poly Resistor	6.4K	8.4K
Diff Resistor	3.6K	3.9K
Poly-Metal Contacts	2.3K	2.6K
Diff-Metal Contacts	1.4K	1.4K
Butting Contacts	3.6K	4.3K

Breakdown

Diff-Substrate	34.0V	34.5V
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Oscillator Frequency

@ 5V	17MHz	17.7MHz
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Process Parameters

Gate Oxide Thickness	990 ^o Å	1000 ^o Å
Field Oxide Thickness	14600 ^o Å	14600 ^o Å
Poly Thickness	5370 ^o Å	5300 ^o Å
Intermediate Oxide Thickness	5000 ^o Å	5400 ^o Å
Diffusion Sheet Resistivity	17.2-17.8 Ω/□	16.2-17.1 Ω/□