

# MEMORY 1997

**Complete Coverage of  
DRAM, SRAM, EPROM,  
and Flash Memory ICs.**

**ICE Staff Contributors:**

Brian Matas  
Christian de Suberbaux

Section 1. The MOS Memory Market

Section 2. The DRAM Market

Section 3. The SRAM Market

Section 4. The EPROM Market

Section 5. The Flash Memory Market

Section 6. General Memory  
Technology Trends

Section 7. DRAM Technology

Section 8. SRAM Technology

Section 9. ROM, EPROM,  
and EEPROM Technology

Section 10. Flash Memory Technology

Section 11. Embedded Memory

Section 12. Glossary of Terms

Section 13. High Density DRAM, SRAM,  
EPROM, and Flash Memory Appendix

Table of Contents and  
List of Illustrations



ISBN: 1-877750-59-X

**Graphic Artists**

Jay Karcher

Alan Johnson

Becky Collins

Todd Wilson

Joe Czerwinski

Eric Shunk

**© 1997 Integrated Circuit Engineering Corporation**

The information on devices or arrangements contained in this text may be covered by patents. The disclosure of any information herein does not convey any license and no liability for patent infringement arising out of the information is assumed.

The information and data contained herein have been compiled from government and non-government technical reports and from material supplied by various manufacturers and are intended to be used for reference purposes. ICE does not warrant the accuracy of this information and data. The user is further cautioned that the data contained herein may not be used in lieu of other contractually cited references and specifications.

All rights reserved. No part of this publication may be reproduced in any form, or by any means without permission in writing from Integrated Circuit Engineering Corporation, 15000 N. 75th Street, Scottsdale, AZ 85260

---

## MEMORY 1997

### Table of Contents

---

NOMENCLATURE .....	.xix
<b>SECTION 1. THE MOS MEMORY MARKET</b>	
Overview .....	.1-1
The ROM Market .....	.1-11
Sharp .....	.1-15
NEC .....	.1-16
Macronix .....	.1-16
American Microsystems Inc. (AMI) .....	.1-16
Siemens .....	.1-17
Fujitsu .....	.1-17
The EEPROM Market .....	.1-17
SGS-Thomson .....	.1-20
Atmel .....	.1-21
Xicor .....	.1-21
Hitachi .....	.1-22
<b>SECTION 2. THE DRAM MARKET</b>	
Overview .....	.2-1
The DRAM Market .....	.2-1
DRAM Unit Shipments .....	.2-5
Unit Shipments by Architecture .....	.2-8
DRAM Average Selling Prices .....	.2-13
DRAM Bit Volume .....	.2-17
DRAM Price per Megabit .....	.2-19
DRAM Consumption and Production .....	.2-22
DRAM Sales Leaders .....	.2-24
4Mbit DRAMs .....	.2-25
16Mbit DRAMs .....	.2-27
Fujitsu .....	.2-29
Hitachi .....	.2-29
Intel .....	.2-29
Mitsubishi .....	.2-29

*Table of Contents*

---

NEC .....	.2-29
Oki .....	.2-30
Toshiba .....	.2-30
64Mbit DRAMs .....	.2-30
Fujitsu .....	.2-31
Hitachi .....	.2-32
Mitsubishi .....	.2-32
Samsung .....	.2-32
Toshiba .....	.2-33
128Mbit DRAM .....	.2-33
256Mbit DRAMs .....	.2-34
Gigabit DRAMs .....	.2-34

**SECTION 3. THE SRAM MARKET**

Overview .....	.3-1
The SRAM Market .....	.3-2
SRAM Unit Shipments .....	.3-4
SRAM Shipments by Speed .....	.3-5
Fast SRAMs .....	.3-5
Slow SRAMs .....	.3-6
SRAM Cache Memory .....	.3-7
SRAM Average Selling Prices .....	.3-8
SRAM Bit Volume .....	.3-12
SRAM Price per Megabit .....	.3-13
SRAM Consumption and Production .....	.3-13
SRAM Sales Leaders .....	.3-14
Alliance .....	.3-16
Cypress .....	.3-16
Fujitsu .....	.3-17
Hitachi .....	.3-17
IBM .....	.3-19
Integrated Device Technology .....	.3-19
Mitsubishi .....	.3-20
Mosel-Vitelic .....	.3-20
Motorola .....	.3-20
NEC .....	.3-20
Paradigm .....	.3-21
Sharp .....	.3-21
Toshiba .....	.3-21
Applications .....	.3-21

**SECTION 4. THE EPROM MARKET**

Overview .....	.4-1
The EPROM Market .....	.4-1

...

INTEGRATED CIRCUIT ENGINEERING CORPORATION

EPROM Unit Shipments .....	.4-4
EPROM Average Selling Prices .....	.4-7
EPROM Bit Volume .....	.4-8
EPROM Price per Megabit .....	.4-9
EPROM Consumption and Production .....	.4-10
EPROM Sales Leaders .....	.4-11
SGS-Thomson .....	.4-15
Advanced Micro Devices .....	.4-15
Texas Instruments .....	.4-17
Fairchild/National .....	.4-17
Atmel .....	.4-18
Cypress .....	.4-18
Hualon .....	.4-19
NEC .....	.4-19
Fujitsu .....	.4-19

## **SECTION 5. THE FLASH MEMORY MARKET**

Overview .....	.5-1
The Flash Memory Market .....	.5-3
Flash Memory Unit Shipments .....	.5-5
Flash Memory Average Selling Prices .....	.5-6
Flash Memory Bit Volume .....	.5-7
Flash Memory Price per Megabit .....	.5-8
Flash Memory Consumption and Production .....	.5-8
Flash Memory Sales Leaders .....	.5-10
Advanced Micro Devices (AMD) .....	.5-11
Atmel .....	.5-14
Catalyst .....	.5-18
Fujitsu .....	.5-18
Hitachi/Mitsubishi .....	.5-18
Intel .....	.5-19
Macronix .....	.5-21
Micron .....	.5-21
Motorola .....	.5-21
Nexcom Technology .....	.5-22
Samsung .....	.5-22
Sanyo .....	.5-22
SGS-Thomson .....	.5-22
Sharp .....	.5-23
Siemens .....	.5-23
Silicon Storage Technology (SST) .....	.5-23
Texas Instruments .....	.5-24
Toshiba .....	.5-25

# Explore Litigation Insights



Docket Alarm provides insights to develop a more informed litigation strategy and the peace of mind of knowing you're on top of things.

## Real-Time Litigation Alerts



Keep your litigation team up-to-date with **real-time alerts** and advanced team management tools built for the enterprise, all while greatly reducing PACER spend.

Our comprehensive service means we can handle Federal, State, and Administrative courts across the country.

## Advanced Docket Research



With over 230 million records, Docket Alarm's cloud-native docket research platform finds what other services can't. Coverage includes Federal, State, plus PTAB, TTAB, ITC and NLRB decisions, all in one place.

Identify arguments that have been successful in the past with full text, pinpoint searching. Link to case law cited within any court document via Fastcase.

## Analytics At Your Fingertips



Learn what happened the last time a particular judge, opposing counsel or company faced cases similar to yours.

Advanced out-of-the-box PTAB and TTAB analytics are always at your fingertips.

### API

Docket Alarm offers a powerful API (application programming interface) to developers that want to integrate case filings into their apps.

### LAW FIRMS

Build custom dashboards for your attorneys and clients with live data direct from the court.

Automate many repetitive legal tasks like conflict checks, document management, and marketing.

### FINANCIAL INSTITUTIONS

Litigation and bankruptcy checks for companies and debtors.

### E-DISCOVERY AND LEGAL VENDORS

Sync your system to PACER to automate legal marketing.