AB-64

APPLICATION BRIEF

4-, 8-, 16-Mbit Byte-Wide FlashFile™ Memory Family Overview

November 1996

Order Number: 292183-002

CONTENTS

REVISION HISTORY

Number	Description
-001	Original version
-002	Added byte-wide Smart 3 and Smart 5 FlashFile™ memory family information

1.0 INTRODUCTION

This document includes a feature overview, pinouts and memory maps for Intel's byte-wide Smart 3, Smart 5, and SmartVoltage FlashFile™ memory families. These products offer feature and function compatibility to the existing byte-wide FlashFile memory product, the 28F008SA, plus some enhancements, including SmartVoltage technology.

2.0 FlashFile™ ARCHITECTURE

Intel's existing byte-wide FlashFile memory product, the 28F008SA, comes in the 8-Mbit density and offers the following features that optimize it for high-density code and file storage.

- High-density 64-Kbyte symmetrically-blocked architecture
- Extended cycling capability (100,000 cycles)
- Erase suspend to read
- High-performance read (85 ns read access time at 5V V_{CC})
- Low voltage operations
- RP# for reset and write protection
- TSOP and PSOP packages

Intel has expanded the byte-wide FlashFile memory family density and integrated enhanced features.

3.0 PINOUT COMPATIBLE DENSITY UPGRADES

The byte-wide Smart 3, Smart 5, and SmartVoltage FlashFile memory families provides density upgrades with pinout compatibility for the 4-, 8-, and 16-Mbit densities. All three densities are available in industry-standard packages: the 40-lead TSOP, ideal for board-constrained applications, and the rugged 44-lead PSOP. The pinout comparisons in Appendix A illustrates these compatible upgrade paths.

4.0 NEW FEATURES

The byte-wide Smart 3, Smart 5, and SmartVoltage FlashFile memory families offer the following new features and benefits:

1. SmartVoltage technology
   - Enables fast factory programming and low-power designs.
     - — 12V V_{PP} option renders the fastest program and erase performance which will increase your factory throughput.
     - — Low voltage V_{CC} options reduce power consumption, enabling low-power designs. The 2.7V V_{CC} option consumes approximately one-fifth the power when operating at 5V V_{CC}.
   - Byte-wide Smart 3 FlashFile products are specifically optimized for 3V systems. They support read operations at 2.7V (read-only) and 3.3V V_{CC} and program and erase operations at 3.3V and 12V V_{PP}. With the 3.3V V_{PP} option, V_{CC} and V_{PP} can be tied together for a simple, low-power 3V design.
   - Byte-wide Smart 5 FlashFile products are specifically optimized for 5V systems. They support read operations at 5V V_{CC} and program and erase operations at 5V and 12V V_{PP}. With the 5V V_{PP} option, V_{CC} and V_{PP} can be tied together for a simple 5V design.
   - Byte-wide SmartVoltage FlashFile products offer a variety of different V_{CC} and V_{PP} voltages to meet difference system requirements. They support read operations at 2.7V (read-only), 3.3V, and 5V V_{CC} and program and erase operations at 3.3V, 5V, and 12V V_{PP}.

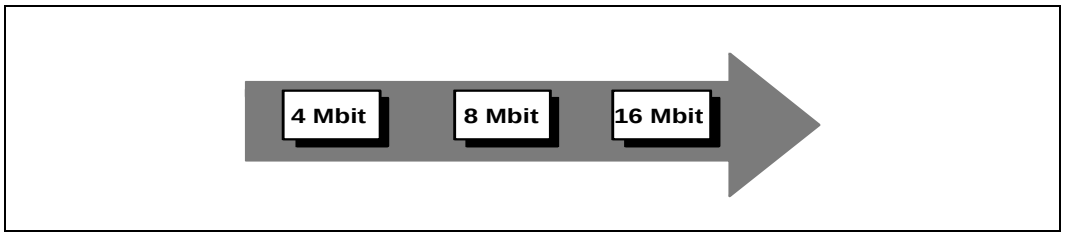


Figure 1. The Byte-Wide Smart 3, Smart 5, and SmartVoltage FlashFile™ Memory Family Features a Package and Pinout-Compatible Upgrade Path

2. Enhanced Write Protection
   - Flexible block locking provides additional protection of critical code and data. This feature allows for absolute protection with hardware locking or flexibility of in-system changes with software locking.
3. Enhanced Interrupt System
   - Program Suspend to Read: enables rigorous design time-dependent storage applications.
   - Erase Suspend to Program: enables continuous program throughput with block erasure taking place in the background.

5.0 UPGRADING FROM 12V TO SmartVoltage TECHNOLOGY

If you are designing with 12V V_{PP} products today, you must adhere to the following design steps to ensure you can upgrade to SmartVoltage technology:

1. Allow for V_{PP} connection to 3.3V or 5V V_{PP}, depending upon your application,s needs.
2. Designs that switch V_{PP} off during read operations for write protection should transition V_{PP} to GND instead of V_{CC}.

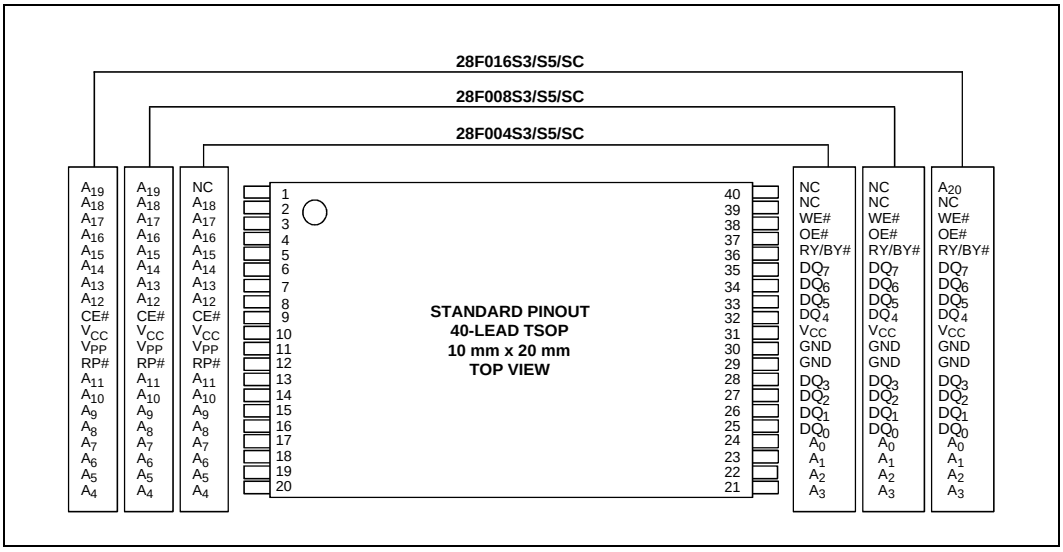
WARNING

Some charge pump designs “turn-off” to $V_{CC}–V_t$ (diode). Check your design for compatibility.

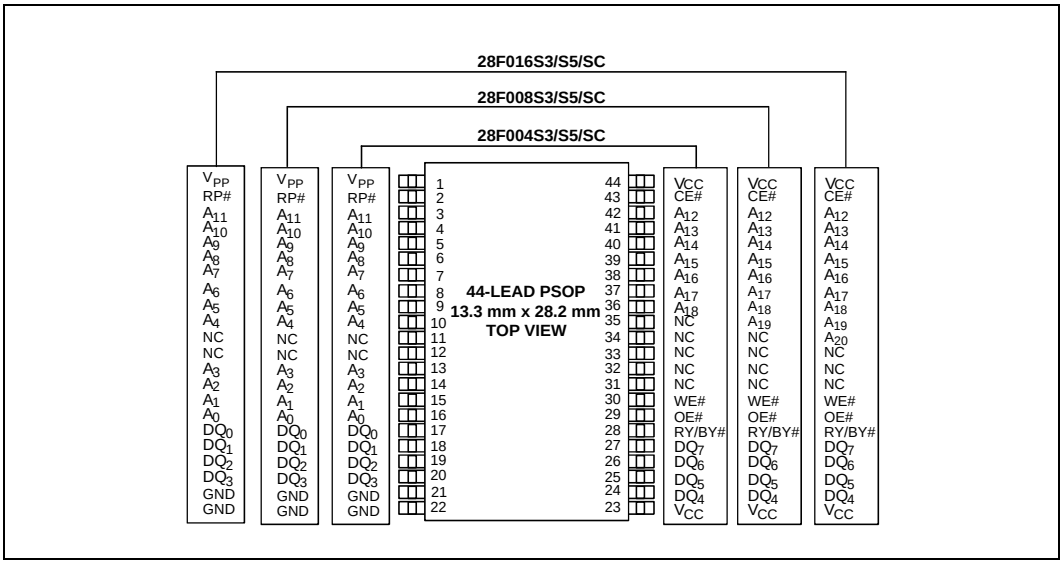
6.0 CONCLUSION

Designing with the package/pinout-compatible 4-, 8-, or 16-Mbit FlashFile memory provides OEMs a cost-effective, worry-free footprint for a variety of byte-wide applications. OEMs can easily increase or decrease flash density with minimal impact in a volume production environment. Intel is the first flash company to offer products on 0.4 micron lithography. Small die sizes allow these new FlashFile memory products to be used in products that previously found flash memory cost-prohibitive. Finally, lower write voltage and program/erase suspend capability offer the opportunity to store data, as well as code in applications—further reducing overall system cost.

APPENDIX A
PINOUT COMPARISON



The 40-Lead TSOP Offers the Smallest Form Factor 4- to 16-Mbit Upgrade Path for Space-Constrained Applications



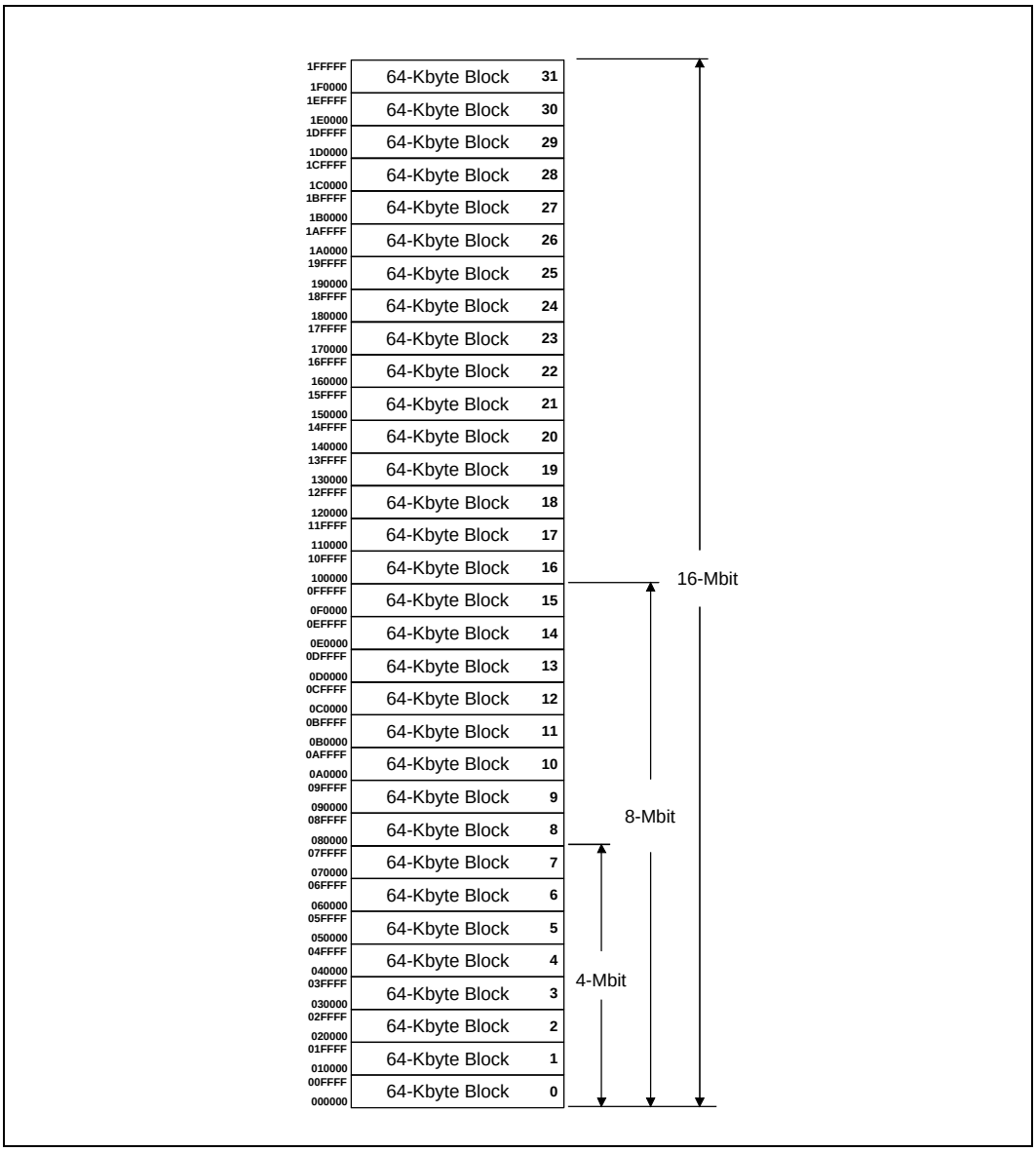
The 44-Lead PSOP Offers a Convenient Upgrade Path for OEMs with 50-mil (PLCC) Assembly Infrastructure from JEDEC ROM Standards

APPENDIX B
BYTE-WIDE Smart 3, Smart 5, AND SmartVoltage FlashFile™ MEMORY PRODUCTS

Byte-Wide Smart 3, Smart 5 and SmartVoltage FlashFile™ Memory Products

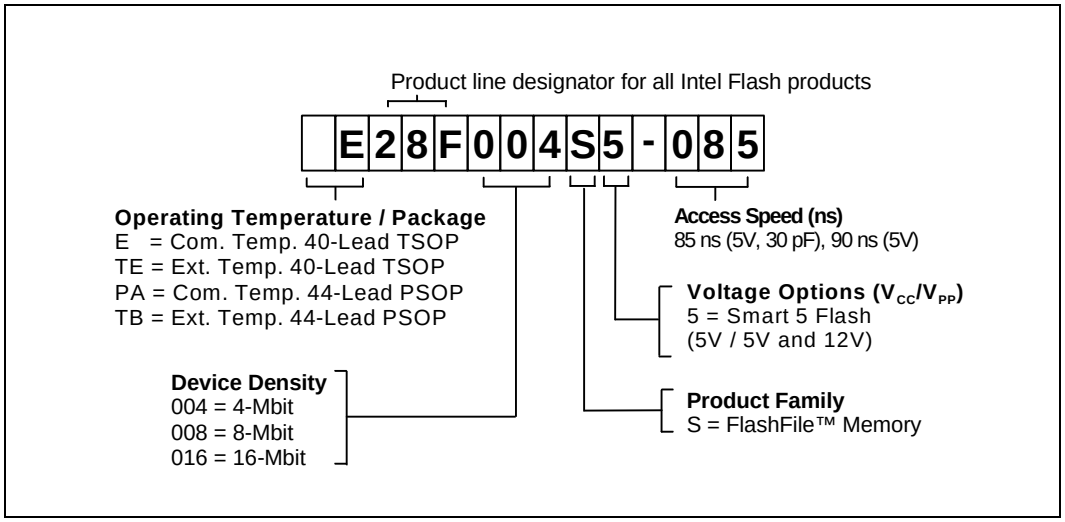
Product	Package	Density	Speed (ns)			V_{PP}	Notes
			2.7V	3.3V	5V		
28F004S3	PSOP (44), TSOP (40)	4 Mbit	150/170	120/150		3.3V/12V	Optimized for 3V designs
28F004S5	PSOP (44), TSOP (40)	4 Mbit			85/120	5V/12V	Optimized for 5V designs
28F004SC	PSOP (44), TSOP (40)	4 Mbit	150/170	120/150	85/120	3.3V/5V/ 12V	Optimized for ultimate voltage flexibility
28F008S3	PSOP (44), TSOP (40)	8 Mbit	150/170	120/150		3.3V/12V	Optimized for 3V designs
28F008S5	PSOP (44), TSOP (40)	8 Mbit			85/120	5V/12V	Optimized for 5V designs
28F008SC	PSOP (44), TSOP (40)	8 Mbit	150/170	120/150	85/120	3.3V/5V/ 12V	Optimized for ultimate voltage flexibility
28F016S3	PSOP (44), TSOP (40)	16 Mbit	150/170	120/150		3.3V/12V	Optimized for 3V designs
28F016S5	PSOP (44), TSOP (40)	16 Mbit			95/120	5V/12V	Optimized for 5V designs
28F016SC	PSOP (44), TSOP (40)	16 Mbit	150/170	120/150	95/120	3.3V/5V/ 12V	Optimized for ultimate voltage flexibility

APPENDIX C
BYTE-WIDE FlashFile™ MEMORY FAMILY MEMORY MAP



Memory Map for 4, 8, 16-Mbit Byte-Wide Components

APPENDIX D
ORDERING INFORMATION



Order Code by Density			Valid Operational Combinations			
					5V V_{CC}	
4-Mbit	8-Mbit	16-Mbit	2.7V V_{CC}, 50pF load	3.3V V_{CC}, 50pF load	10% V_{CC}, 100pF load	5% V_{CC}, 30pF load
Commercial Temperature						
E28F004S3-120	E28F008S3-120	E28F016S3-120	-150	-120		
E28F004S3-150	E28F008S3-150	E28F016S3-150	-170	-150		
E28F004S5-85	E28F008S5-85	E28F016S5-95			-90/-100(1)	-85/-95(1)
E28F004S5-120	E28F008S5-120	E28F016S5-120			-120	
E28F004SC-85	E28F008SC-85	E28F016SC-95	-150	-120	-90/-100(1)	-85/-95(1)
E28F004SC-120	E28F008SC-120	E28F016SC-120	-170	-150	-120	
PA28F004S3-120	PA28F008S3-120	PA28F016S3-120	-150	-120		
PA28F004S3-150	PA28F008S3-150	PA28F016S3-150	-170	-150		
PA28F004S5-85	PA28F008S5-85	PA28F016S5-95			-90/-100(1)	-85/-95(1)
PA28F004S5-120	PA28F008S5-120	PA28F016S5-120			-120	
PA28F004SC-85	PA28F008SC-85	PA28F016SC-95	-150	-120	-90/-100(1)	-85/-95(1)
PA28F004SC-120	PA28F008SC-120	PA28F016SC-120	-170	-150	-120	

NOTE:

1. Valid access time for 16-Mbit byte-wide FlashFile memory.

APPENDIX E
ADDITIONAL INFORMATIONAL

Order Number	Item
290598	*Byte-Wide Smart 3 FlashFile™ Memory Family 4, 8, and 16 Mbit Datasheet*
290597	*Byte-Wide Smart 5 FlashFile™ Memory Family 4, 8, and 16 Mbit Datasheet*
290600	*Byte-Wide SmartVoltage FlashFile™ Memory Family 4, 8, and 16 Mbit Datasheet*
292180	*AP-625 28F008SC Compatibility with 28F008SA*

NOTE:

1. Please call the Intel Literature Center at (800) 548-4725 to request Intel documentation. International customers should contact their local Intel or distribution sales office.
2. Visit Intel's World Wide Web home page at http://www.Intel.com for technical documentation and tools.