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APPLICATION BRIEF

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

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REVISION HISTORY

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

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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 industrystandard packages: the 40-lead TSOP, ideal for boardconstrained 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 lowpower 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 $V_{CC}\mbox{-}V_t$ (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 costeffective, 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 costprohibitive. 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









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

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

			Speed (ns)				
Product	Package	Density	2.7V	3.3V	5V	V _{PP}	Notes
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

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APPENDIX C BYTE-WIDE FlashFile™ MEMORY FAMILY MEMORY MAP

1FFFF	64-Kbyte Block	31	
1EFFFF 1F0000	64-Kbyte Block	30	
1DFFFF 1D0000	64-Kbyte Block	29	
1CFFFF 1C0000	64-Kbyte Block	28	1
1BFFFF 1B0000	64-Kbyte Block	27	
1AFFF	64-Kbyte Block	26	
19FFFF 190000	64-Kbyte Block	25	
18FFFF 180000	64-Kbyte Block	24	
17FFFF 170000	64-Kbyte Block	23	1
16FFF 160000	64-Kbyte Block	22	
15FFFF 150000	64-Kbyte Block	21	
14FFFF 140000	64-Kbyte Block	20	1
13FFFF 130000	64-Kbyte Block	19	
12FFFF 120000	64-Kbyte Block	18	
11FFFF 110000	64-Kbyte Block	17	
10FFFF 100000	64-Kbyte Block	16	16-Mbit
0FFFF 0F0000	64-Kbyte Block	15	
0EFFFF 0E0000	64-Kbyte Block	14	
0DFFFF 0D0000	64-Kbyte Block	13	
0CFFFF 0C0000	64-Kbyte Block	12	
0BFFFF 0B0000	64-Kbyte Block	11	
0AFFF 0A0000	64-Kbyte Block	10	
09FFFF 090000	64-Kbyte Block	9	
08FFFF 080000	64-Kbyte Block	8	
07FFFF 070000	64-Kbyte Block	7] †
06FFFF 060000	64-Kbyte Block	6	
05FFFF 050000	64-Kbyte Block	5	
04FFFF 040000	64-Kbyte Block	4	
03FFFF 030000	64-Kbyte Block	3	
02FFFF 020000	64-Kbyte Block	2	
01FFFF 010000	64-Kbyte Block	1	
00FFFF 000000	64-Kbyte Block	0	
	.		

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



APPENDIX D ORDERING INFORMATION



			Valid Operational Combinations			
Order Code by Density					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.