Designing In SST's Multi-Purpose Flash (39 Series) Byte-wide Products

Application Note
October 2005

INTRODUCTION

This application note introduces the SST 39 series - SST's mainstream Multi-Purpose Flash (MPF) product line. It describes how to convert applications based on AMD's Am29 series, ST Micro's M29 series, and Atmel's AT49 series to SST's 39 series. This application note covers the 3V and 5V versions of 4M, 2M, 1M, and 512K densities.

The analysis of each company's device is written similarly, so that readers can skip ahead to the appropriate manufacturer without missing any information.

SST recommends the following power-down and power-up waveform for the MPF+ family of devices.

TABLE 1: RECOMMENDED POWER-UP/DOWN LIMITS

Symbol	Parameter	Limits			Conditions
		Min	Max	Units	
T_{PF}	V_{DD} Falling Time	3	300	ms	90% to 10% of V_{DD}
T_{PR}	V_{DD} Rising Time	0.1	300	ms	10% to 90% of V_{DD}
T_{OFF}	V_{DD} Off Time	100		ms	
V_{OFF}	V_{DD} Off Level		0.3	V	0V (recommended)

T1.0 2014

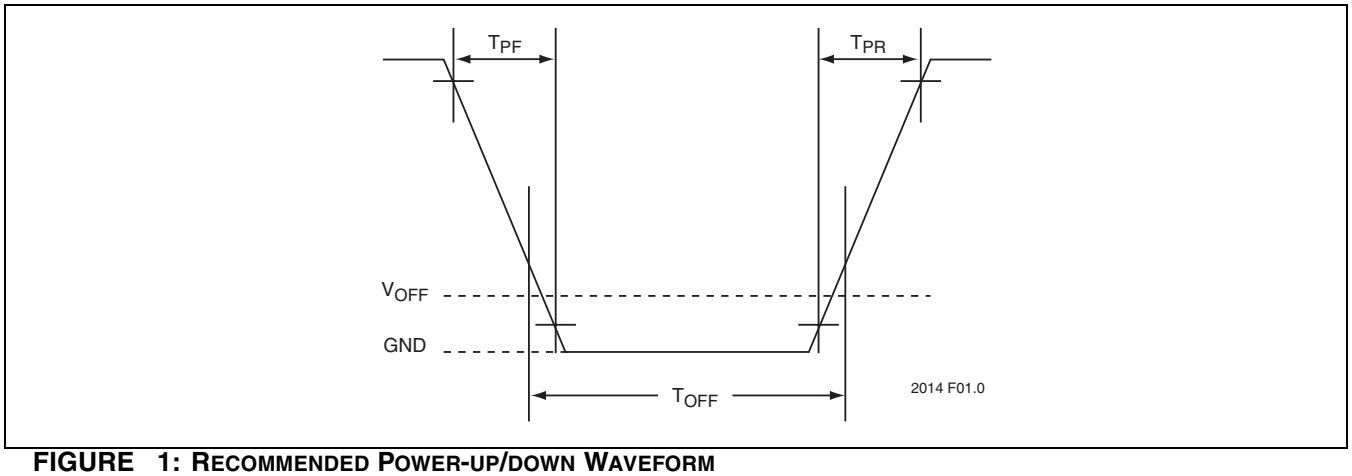

FIGURE 1: RECOMMENDED POWER-UP/DOWN WAVEFORM

Application Note

SST AND AMD

Comparisons with the AMD Am29F series

AMD's Am29F series includes 1M, 2M, and 4M devices; the Am29F010, Am29F002(N), and Am29F040, respectively. AMD also has 1M, 2M, and 4M devices in the Am29LV series - Am29LV010, Am29LV002, and Am29LV040.

For the SST39SF series, the corresponding devices offered are SST39SF010A (1M), SST39SF020A (2M), and SST39SF040 (4M). For the SST39VF series, the corresponding products offered are SST39VF010 (1M), SST39VF020 (2M), and SST39VF040 (4M).

TABLE 2: VOLTAGE COMPARISONS

	AMD	SST
5V	Am29F	SST39SF
3V	Am29LV	SST39VF

T2.0 2014

Hardware Comparisons

The AMD devices - the Am29F010, the Am29F002N, and the AM29F040 are offered in 32-pin PLCC, PDIP, and TSOP (8mm x 20mm) packages.

- **1M Pinout Comparison**

The SST39SF010A is fully pin compatible with the Am29F010 in PLCC and PDIP packages. For TSOP packages, AMD has an 8mm x 20mm package, as opposed to SST's 8mm x 14mm package. Please refer to the application note, *Recommended Land Pattern for SST TSOP Devices*, which describes how to use both packages in the same design.

Note that the same comparisons as above apply to the Am29LV010 and the SST39VF010.

- **2M Pinout Comparison**

AMD offers two 2M products - the Am29F002 and Am29F002N. The Am29F002 has a RESET# pin, which is a no-connect on the Am29F002N. Both products are offered in 32-pin PDIP, PLCC, and TSOP (8mm x 20mm) packages. The SST39SF020A is fully pin compatible with the Am29F002N in PLCC and PDIP packages. In the case of the Am29F002, the only difference between this device and the SST39SF020A is the RESET# pin. The purpose of RESET# on the Am29F002 is to terminate any operation in progress because of long erase times and resetting the internal state machine to reading array data. This pin is a no-connect on the SST39SF020A. (Since SST39SF020A Sector-Erase of 25 ms is 80 times faster than that of the AM29F002, a reset pin is typically not needed for SST devices.) The absence of this signal on the SST device does not affect the normal operation of the SST device. As a result, the SST39SF020A can be used in an Am29F002/002N design without any modifications in board layout for PLCC and PDIP designs.

For the Am29F002/002N TSOP packages, AMD has an 8mm x 20mm package as opposed to SST's 8mm x 14mm package. Please refer to the application note, *Recommended Land Pattern for SST TSOP Devices*, which describes how to use both packages in the same design.

Note that the same comparisons as above apply between the Am29LV002 and the SST39VF020.

- **4M Pinout Comparison**

The SST39SF040 is fully pin compatible with the Am29F040 in PLCC and PDIP packages. For TSOP packages, AMD has an 8mm x 20mm package, as opposed to SST's 8mm x 14mm package. Please refer to the application note, *Recommended Land Pattern for SST TSOP Devices*, which describes how to use both packages in the same design.

Note that the same comparisons as above apply between the Am29LV040 and the SST39VF040.

Software Comparisons

The SST and AMD devices use the same command set for Byte-Program, Chip-Erase, Read-ID and Reset operation as described in the table below.

Note that although the following notes describe the difference between 5V flash from AMD and SST, identical comparisons are valid for describing the 3V flash from AMD and SST. Also note that for the SDP command cycles, AMD does not use any of the address bits as the standard JEDEC command set e.g. AMD uses xxxxH, whereas SST uses 5555H.

TABLE 3: COMMAND SEQUENCE COMPARISONS

Command	SST	AMD
Byte-Program	4-Byte	Same
Chip-Erase	6-Byte	Same
Sector-Erase	6-Byte (30H)	6-Byte (30H) different sector address
Software Exit ID/Reset	1-Byte	Same
Read-ID	3-Byte	Same
Erase-Suspend/ -Resume	Not required	1-Byte sequence

T3.0 2014

The primary difference is Sector-Erase operation which is described here: the Sector-Erase operation for both SST39 and AMD devices use the same six-byte command sequence with the same command data of 30H, but different sector addresses during that byte-sequence. This is due to the difference in sector sizes of the SST and AMD. Also note that for the SDP command cycles, AMD only specifies a subset of the standard JEDEC command address bits e.g. AMD uses x555H, whereas SST uses 5555H.

- The Am29F010 is based on uniform sector architecture of 16 KByte each, as opposed to 4 KByte in the SST39SF010A. So the SST39SF010A device has 32 sectors vs. 8 sectors for the Am29F010 device. Therefore, when a Sector-Erase operation is performed, the SST39SF010A device will use address lines A_{16}-A_{12} to decode sector address as opposed to A_{16}-A_{14} on the Am29F010 device. These differences in sector address decoding should be accounted for by the software drivers.
- The Am29F002/002N has one 16 KByte, two 8 KByte, one 32 KByte and three 64 KByte sectors. By contrast, the SST39SF020A has sectors of uniform sector size of 4 KByte. So the SST39SF020A device has 64 sectors vs. 8 sectors for the Am29F002/002N device. Consequently, when a Sector-Erase operation is performed, the SST39SF020A device will use address lines A_{17}-A_{12} to decode sector address as opposed to A_{17}-A_{13} on the Am29F002/002N device. These differences in sector address decoding should be accounted for by the software drivers.
- The Am29F040 is based on uniform sector architecture of 64 KByte each, as opposed to 4 KByte in the SST39SF040. So the SST39SF040 device has 128 sectors vs. 8 sectors for the Am29F040 device. Therefore, when a Sector-Erase operation is performed, the SST39SF010A device will use address lines A_{18}-A_{12} to decode sector address as opposed to A_{18}-A_{14} on the Am29F040 device. These differences in sector address decoding should be accounted for by the software drivers.

In addition to the above differences, AMD also has a command called Erase-Suspend/Resume on both the Am29F010 and the Am29F002/002N. This is needed because the AM29F/LVxxx devices take several seconds to erase the sector and therefore need the capability to interrupt and suspend erase operations to perform Read operation. On the other hand, SST only takes few milliseconds to perform an Erase operation, and therefore does not require this command. For this reason, the Erase-Suspend/Resume command is not supported and will be ignored by SST 39 series devices.

Comparisons with the AMD Am29LV017D

For 16M, AMD offers the Am29LV017D. This device reads, programs, and erases with a single 2.7-3.6V power supply voltage.

Hardware Comparisons

The SST39VF016 and Am29LV017D devices are offered in JEDEC standard 10mm x 20mm 40-lead TSOP packages and have the same pin assignments for basic functions. SST also offers this product in a BGA package with the same ball assignments as AMD. The only differences in pin assignments between these two products are on pins 10 and 12, as described in the table below.

TABLE 4: PIN DIFFERENCES

	SST	AMD
Pin 10	NC[1]	RESET#
Pin 12	NC	RY/BY#

T4.0 2014

1. No connect

The Am29LV017D has a hardware reset function (RESET#) whereas the SST39VF016 has a no-connect on pin 10. The purpose of the RESET# is to terminate any operation in progress and reset the internal state machine to read array data. The only difference is that in SST's case, an Erase or Program operation is allowed to complete, whereas in the case of AMD, such an operation is interrupted by the RESET# command. The system would have to wait for SST's operation to complete before it can read. However, it is important to note that while AMD has a Sector-Erase time of 15s, SST erases an equivalent block in 25 ms. For Byte-Programming, AMD specifies a maximum of 300 µs, whereas SST specifies 20 µs. As a result, the absence of a RESET# pin is typically not an issue.

The Ready/Busy pin (RY/BY#) on the AMD device provides an additional hardware method of detecting completion of Program or Erase cycles. In the case of AMD, the RY/BY# pin is necessary because AMD has an internal state machine that varies the length of the Write pulse width. SST, on the other hand, is able to use a fixed pulse width to program and erase its devices since SST's flash cell architecture enables more stable device characteristics over the product lifetime. As a result, SST does not require a RY/BY# pin and does not offer it.

The above table describes the differences in the TSOP pin assignments; note that the same functional differences exist between the BGA packages of this product.

In summary, an SST39VF016 can be used on existing Am29LV017D-based design without any board layout changes when used in x16 mode.

Software Comparisons

The SST39VF016 uses the standard JEDEC command set for single-power-supply flash memory while Am29LV017D only uses JEDEC-compatible command sequences. The command sets for basic device operations between the two products are identical except that AMD only specifies a subset of the standard JEDEC command address bits e.g. AMD uses x555H, whereas SST uses 5555H. For more details, please refer to the data sheet of each product.

TABLE 5: COMMAND SET COMPARISON

	SST	AMD
Word-Program	4 Cycle with A0H	Same
Sector-Erase	6 Cycle with 30H	Same
Block-Erase	6 Cycle with 50H	N/A
Chip-Erase	6 Cycle with 10H	Same
ID Entry	3 Cycle with 90H	Same
ID Exit	1 or 3 Cycle with F0H	Same

T5.0 2014

The Sector-Erase operations of SST and AMD devices use the same six-byte command sequence with the same command data of 30H, but different sector addresses during their sixth byte sequence. This is due to the difference in sector architectures between SST and AMD products. The Am29LV017D consists of one 8 KWord, two 4 KWord, one 16 KWord, and thirty-one 64 KByte sectors. On the other hand, the SST39VF016 consists of 512 uniform 4 KByte sectors. This difference in sector architectures results in the SST device having more sectors than the AMD device. Therefore, when a Sector-Erase operation is performed, the SST device will use address lines A_{20}-A_{11} to decode sector addresses as opposed to the AMD device using A_{20}-A_{12}. These differences in sector address decoding should be accounted for by the software driver.

In addition to the Sector-Erase command which erases uniform small sectors, the SST39VF016 offers a Block-Erase command. While a Sector-Erase operation erases 4 KByte sectors on an SST device, a Block-Erase operation erases 64 KByte blocks. Each block consists of sixteen 4 KByte sectors. This flexible sector/block erasability allows a system designer to use the Sector-Erase capability for finer software granularity and the Block-Erase capability for faster Erase operations. Note that the AMD device erases 64 KByte sectors using a Sector-Erase command (30H), while the SST device erases 64 KByte blocks using a Block-Erase command (50H).

In summary, when an SST39VF016 is used on an existing Am29LV017D-based design, minor modifications to the software driver are required.

For 8M flash products, the same analogies apply: the only difference is that A_{19} is the most significant address. (Am29VF081B and SST39VF080) For 8M, however, AMD doesn't offer the BGA package, while SST offers one as a low density migration from 16M.

SST AND ST MICROELECTRONICS

Comparisons with the ST Micro M29 series

ST Micro's M29F series includes 512K, 1M, 2M, and 4M devices; the M29F512, M29F010, M29F002 and M29F040, respectively. ST Micro also has 512K, 1M, 2M, and 4M devices in the M29W series - M29W512, M29W010, M29W002, and M29W040.

For the SST39SF series, the corresponding devices offered are SST39SF512 (512K), SST39SF010A (1M), SST39SF020A (2M) and SST39SF040 (4M). For the SST39VF series, the corresponding products offered are SST39VF512 (512K), SST39VF010 (1M), SST39VF020 (2M) and SST39VF040 (4M)

TABLE 6: VOLTAGE COMPARISONS

	ST Micro	SST
5V	ST Micro M29F	SST39SF
3V	ST Micro M29W	SST39VF

T6.0 2014

Hardware Comparisons

The ST Micro devices - the M29F010, the Am29F002N, and the M29F040 are offered in 32-pin PLCC, PDIP, and TSOP (8mm x 20mm) packages.

- **512K Pinout Comparison**

The ST Micro M29F512 is offered in 32-pin PLCC, PDIP, and TSOP packages.

In the PLCC and PDIP packages, an SST39SF512 series is fully pin compatible with an ST Micro M29F512 device. As a result, the SST39SF512 device can be used in an ST Micro design without any modifications in board layout.

For TSOPs, ST Micro offers both 8mm x 20mm and 8mm x 14mm packages. For an 8mm x 14mm package, SST 39 series devices are fully pin compatible with ST Micro's 8mm x 14mm TSOP device of the same density, and can

therefore substitute it without any board layout modifications. A system design which currently uses ST Micro's 8mm x 20mm package can use SST's 8mm x 14mm package if a longer trace is used.

Note that the same comparisons as above apply to the M29W512 and the SST39VF512.

- **1M Pinout Comparison**

The SST39SF010A is fully pin compatible with the M29F010 in PLCC and PDIP packages. For TSOP packages, ST Micro has an 8mm x 20mm package, as opposed to SST's 8mm x 14mm package. Please refer to the application note, *Recommended Land Pattern for SST TSOP Devices*, which describes how to use both packages in the same design.

Note that the same comparisons as above apply to the M29W010 and the SST39VF010.

- **2M Pinout Comparison**

ST Micro offers one 2M product - the M29F002. The M29F002 has a RESET# pin. Both ST Micro and SST offer products in 32-pin PDIP, PLCC, and TSOP (8mm x 20mm) packages. The SST39SF020A is fully pin compatible with the PLCC and PDIP packages. The purpose of RESET# on the M29F002 is to terminate any operation in progress because of long erase times and resetting the internal state machine to reading array data. This pin is a no-connect on the SST39SF020A. (Since SST39SF020A erase of 100 ms is 150 times faster than that of the M29F002, a reset pin is typically not needed for SST devices.) The absence of this signal on the SST device does not affect the normal operation of the SST device. As a result, the SST39SF020A can be used in an M29F002 design without any modifications in board layout for PLCC and PDIP designs.

For the M29F002 TSOP packages, ST Micro has an 8mm x 20mm package as opposed to SST's 8mm x 14mm package. Please refer to the application note, *Recommended Land Pattern for SST TSOP Devices*, which describes how to use both packages in the same design.

Note that the same comparisons as above apply between the M29W002 and the SST39VF020.

- **4M Pinout Comparison**

The SST39SF040 is fully pin compatible with the M29F040 in PLCC and PDIP packages. For TSOP packages, ST Micro has an 8mm x 20mm package, as opposed to SST's 8mm x 14mm package. Please refer to the application note, *Recommended Land Pattern for SST TSOP Devices*, which describes how to use both packages in the same design.

Note that the same comparisons as above apply between the M29W040 and the SST39VF040.

Software Comparisons

The SST and ST Micro devices use the same command set for Byte-Program, Chip-Erase, Read-ID and Reset operation as described in the table below. Note that although the following notes describe the difference between 5V flash from ST Micro and SST, identical comparisons are valid for describing the 3V flash from ST Micro and SST.

TABLE 7: COMMAND SEQUENCE COMPARISONS

Command	SST	ST MICRO
Byte-Program	4-Byte	Same
Chip-Erase	6-Byte	Same
Sector-Erase	6-Byte (30H)	6-Byte (30H) different sector address
Software Exit ID/Reset	1-Byte	Same
Read-ID	3-Byte	Same
Erase-Suspend/ -Resume	Not required	1-Byte

T7.0 2014

The primary difference is Sector-Erase operation which is described here: The Sector-Erase operation for both SST39 and ST Micro devices use the same six-byte command sequence with the same command data of 30H, but different sector addresses during that byte-sequence. This is due to the difference in sector sizes of the SST and ST Micro.

- For the M29F512, the primary difference between SST and ST Micro is the Sector-Erase operation, which is not offered by the ST Micro M29F512 device. ST Micro has a boot block of 8 KByte, and a single block comprising the remainder of the memory, and they only support Chip-Erase. SST, on the other hand, has uniform 4 KByte sectors on the SST39SF512. As a result, a SST39SF512 device can use the same software as the ST Micro M29F512 device, since SST39SF512 device offers both Sector-Erase and Chip-Erase.

  Some ST Micro designs may protect this 8 KByte sector, so that, during Chip-Erase, this sector is not erased with the other block. If this feature is enabled, then the software would have to be modified to do Sector-Erase operations on the SST device in place of the Chip-Erase on the protected ST Micro device, so that the sectors corresponding to the boot block are

not erased. An alternative is to erase the entire chip, and then re-program the two SST sectors corresponding to the ST Micro boot-block.

- The M29F010 is based on uniform sector architecture of 16 KByte each, as opposed to 4 KByte in the SST39SF010A. So the SST39SF010A device has 32 sectors vs. 8 sectors for the M29F010 device. Therefore, when a Sector-Erase operation is performed, the SST39SF010A device will use address lines A_{16}-A_{12} to decode sector address as opposed to A_{16}-A_{14} on the M29F010 device. These differences in sector address decoding should be accounted for by the software drivers.
- The M29F002 has one 16 KByte, two 8 KByte, one 32 KByte and three 64 KByte sectors. By contrast, the SST39SF020A has sectors of uniform sector size of 4 KByte. So the SST39SF020A device has 64 sectors vs. 7 sectors for the M29F002 device. This difference in sector size results in the SST39SF020A device having more sectors (sixty-four on SST39SF020A vs. seven on M29F002). Consequently, when a Sector-Erase operation is performed, the SST39SF020A device will use address lines A_{17}-A_{12} to decode sector address as opposed to A_{17}-A_{13} on the M29F002 device. These differences in sector address decoding should be accounted for by the software drivers.
- The M29F040 is based on uniform sector architecture of 64 KByte each, as opposed to 4 KByte in the SST39SF040. This difference in sector size results in the SST39SF040 device having more sectors (One hundred and twenty-eight on SST39SF040 vs. eight on M29F040). Therefore, when a Sector-Erase operation is performed, the SST39SF040 device will use address lines A_{18}-A_{12} to decode sector address as opposed to A_{18}-A_{14} on the M29F040 device. These differences in sector address decoding should be accounted for by the software drivers.

In addition to the above differences, ST Micro also has a command called Erase-Suspend/Resume on both the M29F010 and the M29F002. This is needed because the ST Micro M29F/Wxxx devices take several seconds to erase the sector and therefore need the capability to interrupt and suspend erase operations to perform Read operation. On the other hand, SST only takes few milliseconds to perform an Erase operation, and therefore does not require this command. For this reason, the Erase-Suspend/ Resume command is not supported and will be ignored by SST 39 series devices.

Note that although the above notes describe the difference between 5V flash from ST Micro and SST, identical comparisons are valid for describing the 3V flash from ST Micro and SST. Consequently, the SST's 39 series flash can be used to substitute ST Micro equivalents with minimal design changes.

Comparisons with the ST Micro M29W017D

For 16M, ST Microelectronics offers the M29W017D. This device reads, programs, and erases with a single 2.7-3.6V power supply voltage.

Hardware Comparisons

The SST39VF016 and ST Micro's M29W017D are offered in JEDEC standard 10mm x 20mm 40-lead TSOP packages and have the same pin assignments for basic functions. SST also offers this product in a BGA package with the same ball assignments as ST Micro. The only differences in pin assignments between these two products are on pins 10 and 12, as described in the following table.

TABLE 8: PIN DIFFERENCES

	SST	ST MICRO
Pin 12	NC[1]	RESET#
Pin 15	NC	RY/BY#

T8.0 2014

1. No connect

The M29W017D has a hardware reset function (RESET#) on pin 12 whereas the SST39VF016 has a no-connect on this pin. The purpose of RESET# is to terminate any operation in progress and reset the internal state machine to read array data. The only difference is that in SST's case, an Erase or Program operation is allowed to complete, whereas in the case of the competitor, such an operation is interrupted by the RESET# command. The system would have to wait for SST's operation to complete before it can read. Since SST has faster Erase and Program times, waiting is not an issue.

The Ready/Busy pin (RY/BY#) on the ST Microelectronics device provides an additional hardware method of detecting completion of a Program or Erase cycle. In the case of ST Microelectronics, the RY/BY# pin is necessary because ST Microelectronics has an internal state machine that varies the length of the Write pulse width. SST, on the other hand, uses a fixed pulse width to program and erase its devices. As a result, SST does not require a RY/BY# pin and does not offer it.

In summary, an SST39VF016 can be used on an existing M29W017D-based design without any board layout changes when used in x16 mode.

Software Comparisons

The SST39VF016 uses the standard JEDEC command set for x16 single-power-supply flash memory while the M29W017D only uses JEDEC-compatible command sets. The command sequences for basic device operations between the two products are identical except that ST Micro does not specify any of the standard JEDEC command address e.g. ST Micro uses xxxxH, whereas SST uses 5555H. For more details, please refer to the data sheet of each product.

TABLE 9: COMMAND SET COMPARISON

	SST	ST MICRO
Word-Program	4 Cycle with A0H	Same
Sector-Erase	6 Cycle with 30H	Same
Block-Erase	6 Cycle with 50H	N/A
Chip-Erase	6 Cycle with 10H	Same
ID Entry	3 Cycle with 90H	Same
ID Exit	1 or 3 Cycle with F0H	Same

T9.0 2014

The Sector-Erase operations of SST and ST Microelectronics devices use the same six-byte command sequence with the same command data of 30H, but different sector addresses during their sixth byte sequence. This is due to the differences in sector architectures between SST and ST Microelectronics products. The M29W017D consists of one 8 KWord, two 4 KWord, one 16 KWord, and thirty-one 64 KByte sectors. On the other hand, the SST39VF016 consists of 512 uniform 4 KByte sectors. This difference in sector architectures results in the SST device having more sectors than the ST Microelectronics device. Therefore, when a Sector-Erase operation is performed, the SST device will use address lines A_{19}-A_{11} to decode sector addresses as opposed to the ST Microelectronics device using A_{19}-A_{12}. These differences in sector address decoding should be accounted for by the software driver.

In addition to the Sector-Erase command which erases uniform small sectors, the SST39VF016 offers a Block-Erase command. While the Sector-Erase operation erases 4 KByte sectors on the SST device, a Block-Erase operation erases 64 KByte blocks. Each block consists of sixteen 4 KByte sectors. This flexible sector/block erasability allows a system designer to use the Sector-Erase capability for finer software granularity and the Block-Erase capability for faster Erase operations. Note that the ST Microelectronics device erases 64 KByte sectors using a Sector-Erase command (30H), while the SST device erases 64 KByte blocks using a Block-Erase command (50H).

In summary, when an SST39VF016 is used on an existing M29W017D-based design, minor modifications to the software driver are required.

For 8M flash products, the same analogies apply: the only difference is that A_{19} is the most significant address. ST Micro's part is the M29W008A, whereas SST's part is the SST39VF080. For 8M, ST Micro did offer the BGA package, but discontinued it later. SST has, however, introduced the SST39VF080 as a low density migration from 16M. Note that the same differences described above apply when comparing the ST Micro 8M with the SST 8M products.

SST AND ATMEL

Comparisons with the Atmel AT49F series

In the AT49F series, Atmel offers the following 4M, 2M, 1M, and 512K devices - the AT49F040, AT49F020, AT49F010, and AT49F512 (in that order). SST's equivalent offerings are the SST39SF040, SST39SF020A, SST39SF010A, and SST39SF512.

TABLE 10: VOLTAGE COMPARISONS

	ATMEL	SST
5V	49F	SST39SF
3V	49LV	SST39VF

T10.0 2014

Hardware Comparisons

The AT49F512, AT49F010, AT49F020, and AT49F040 are all are offered in 32-pin PLCC, PDIP, and TSOP packages.

In the PLCC and PDIP packages, an SST 39 series is fully pin compatible with an Atmel AT49F device of the same density. As a result, the SST 39 series device can be used in an Atmel design without any modifications in board layout.

For TSOPs, Atmel offers both 8mm x 20mm and 8mm x 14mm packages. For an 8mm x 14mm package, SST 39 series devices are fully pin compatible with Atmel's 8mm x 14mm TSOP device of the same density, and can therefore substitute it without any board layout modifications. A system design which currently uses Atmel's 8mm x 20mm package can use SST's 8mm x 14mm package if a longer trace is used.

Software Comparisons

The SST 39 series and AT49 series devices use the same command set for Byte-Program, Chip-Erase, Read-ID, and Reset operation as described in the table below.

TABLE 11: COMMAND SEQUENCE COMPARISONS

Command	SST	ATME;
Byte-Program	4-Byte	Same
Chip-Erase	6-Byte	Same
Sector-Erase	6-Byte	Not supported
Software Exit ID/Reset	1 or 3-Byte	Same
Read-ID	3-Byte	Same
Boot block lockout	Not supported	6-Byte

T11.0 2014

The primary difference between SST and Atmel is the Sector-Erase operation, which is not offered by the AT49 series products. Atmel has a boot block of 8 KByte, and a single block comprising the remainder of the memory (like 248 KByte for 49F020), and they only support Chip-Erase. SST, on the other hand, has uniform 4 KByte sectors. As a result, a SST 39 series device can use the same software as the corresponding AT49F device, since SST 39 series devices offer both Sector-Erase and Chip-Erase, if the boot block is not protected.

Some Atmel designs may protect this 8 KByte sector, so that, during Chip-Erase, this sector is not erased with the other block. If this feature is enabled, then the software would have to be modified to do Sector-Erase operations on the SST device in place of the Chip-Erase on the protected Atmel device, so that the sectors corresponding to the boot block are not erased. An alternative is to erase the entire chip, and then re-program the two SST sectors corresponding to the Atmel boot block.

Note that although the above notes describe the difference between 5V flash from Atmel and SST, identical comparisons are valid for describing the 3V flash from Atmel and SST. Consequently, the SST's 39 series flash can be used to substitute Atmel equivalents with minimal design changes.

Comparisons with the AT49LV008A

For 8M, Atmel offers the AT49LV008A. This device reads, programs, and erases with a single 2.7-3.6V power supply voltage.

Hardware Comparisons

The SST39VF080 and Atmel's AT49LV008A are offered in JEDEC standard 10mm x 20mm 40-lead TSOP packages and have the same pin assignments for basic functions. SST also offers this product in a BGA package with the same ball assignments as Atmel. The only differences in pin assignments between these two products are on pins 10 and 12, as described in the following table.

TABLE 12: PIN DIFFERENCES

	SST	ATMEL
Pin 12	NC[1]	RESET#
Pin 15	NC	RY/BY#

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1. No connect

The AT49LV008A has a hardware reset function (RESET#) on pin 12 whereas the SST39VF080 has a no-connect on this pin. The purpose of RESET# is to terminate any operation in progress and reset the internal state machine to read array data. The only difference is that in SST's case, an Erase or Program operation is allowed to complete, whereas in the case of the competitor, such an operation is interrupted by the RESET# command. The system would have to wait for SST's operation to complete before it can read. Since SST has faster Erase and Program times, waiting is not an issue.

The Ready/Busy pin (RY/BY#) on the Atmel device provides an additional hardware method of detecting completion of a Program or Erase cycle. In the case of Atmel, the RY/BY# pin is necessary because Atmel has an internal state machine that varies the length of the Write pulse width. SST, on the other hand, uses a fixed pulse width to program and erase its devices. As a result, SST does not require a RY/BY# pin and does not offer it.

In summary, an SST39VF080 can be used on an existing AT49LV008A-based design without any board layout changes when used in x16 mode.

Software Comparisons

The SST39VF080 uses the JEDEC standard command set for x16 single-power-supply flash memory while the AT49LV008A uses JEDEC-compatible command sets. The command sequences for basic device operations between the two products are identical. For more details, please refer to the data sheet of each product.

TABLE 13: COMMAND SET COMPARISON

	SST	ATMEL
Word-Program	4 Cycle with A0H	Same
Sector-Erase	6 Cycle with 30H	Same
Block-Erase	6 Cycle with 50H	N/A
Chip-Erase	6 Cycle with 10H	Same
ID Entry	3 Cycle with 90H	Same
ID Exit	1 or 3 Cycle with F0H	Same

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The Sector-Erase operations of SST and Atmel devices use the same six-byte command sequence with the same command data of 30H, but different sector addresses during their sixth byte sequence. This is due to the differences in sector architectures between SST and Atmel products. The AT49LV008A consists of one 8 KWord, two 4 KWord, one 16 KWord, and thirty-one 64 KByte sectors. On the other hand, the SST39VF080 consists of 512 uniform 4 KByte sectors. This difference in sector architectures results in the SST device having more sectors than the Atmel device. Therefore, when a Sector-Erase operation is performed, the SST device will use address lines A_{19}-A_{11} to decode sector addresses as opposed to the Atmel device using A_{19}-A_{12}. These differences in sector address decoding should be accounted for by the software driver.

In addition to the Sector-Erase command which erases uniform small sectors, the SST39VF080 offers a Block-Erase command. While the Sector-Erase operation erases 4 KByte sectors on the SST device, a Block-Erase operation erases 64 KByte blocks. Each block consists of sixteen 4 KByte sectors. This flexible sector/block erasability allows a system designer to use the Sector-Erase capability for finer software granularity and the Block-Erase capability for faster Erase operations. Note that the Atmel device erases 64 KByte sectors using a Sector-Erase command (30H), while the SST device erases 64 KByte blocks using a Block-Erase command (50H).

In summary, when an SST39VF080 is used on an existing AT49LV008A-based design, minor modifications to the software driver are required.

SOFTWARE DRIVERS

SST provides software drivers for its devices both in 'C' and 8086 assembly languages. The drivers are available on SST's website at www.sst.com.