DATA SHEET [PRELIMINARY]
SILICONDRIVE III 2.5" PATA DRIVE
SSD-Dxxx(x)-5000

OVERVIEW

The SiliconDrive III 2.5" PATA Drive is an optimal time-to-market replacement for hard drives and flash cards or in host systems that require low power and scalable storage solutions.

Numerous SiliconSystems patented and patent-pending application-specific technologies can be integrated into SiliconDrive III to safeguard application data and software IP. Application notes detailing these performance-enhancing options are available under NDA.

SiliconDrive III technology is engineered exclusively for the high performance, high reliability and multi-year product lifecycle requirements of the Enterprise System OEM market. Typical end-market applications include broadband data and voice networks, military systems, flight system avionics, medical equipment, industrial control systems, video surveillance, storage networking, VoIP, wireless infrastructure, and interactive kiosks.

Every SiliconDrive III is integrated with SiliconSystems patented PowerArmor and patent-pending SiSMART to virtually eliminate storage systems failures.

PowerArmor prevents data corruption and loss from power disturbances by integrating patented technology into every SiliconDrive III.

SiSMART acts as an early warning system to eliminate unscheduled downtime by constantly monitoring and reporting the exact amount of remaining storage system useful life.

FEATURES

- RoHS 6 of 6 compliant
- Integrated PowerArmor and SiSMART technology
- Capacity range: 30GB to 120GB
- Available Capacities: 30GB, 60GB, 90GB, and 120GB
- MTBF: 3,000,000 hours
- ATA-6 compliant
- Read transfer rate: Up to 100MBps
- Write transfer rate: Up to 80MBps
- Burst transfer rate: 100MBps
- Temperature: -40°C to 85°C
- Power consumption:
  - Standby: 0.5W
  - Read: 1W
  - Write: 1W
- Vibration: 16.3gRMS
- Shock: 1000G
- Altitude: 80,000ft.

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REVISION HISTORY

Document No.	Release Date	Changes
5000D-00DSR	March 16, 2009	Initial release.

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PHYSICAL SPECIFICATIONS

The SiliconDrive III 2.5" PATA Drive product is offered in an industry-standard 2.5" PATA Drive form factor. See "Part Numbering" on page 18 for details regarding 2.5" PATA Drive capacities.

PHYSICAL DIMENSIONS

This section provides diagrams that describe the physical dimensions for the 2.5" PATA Drive.

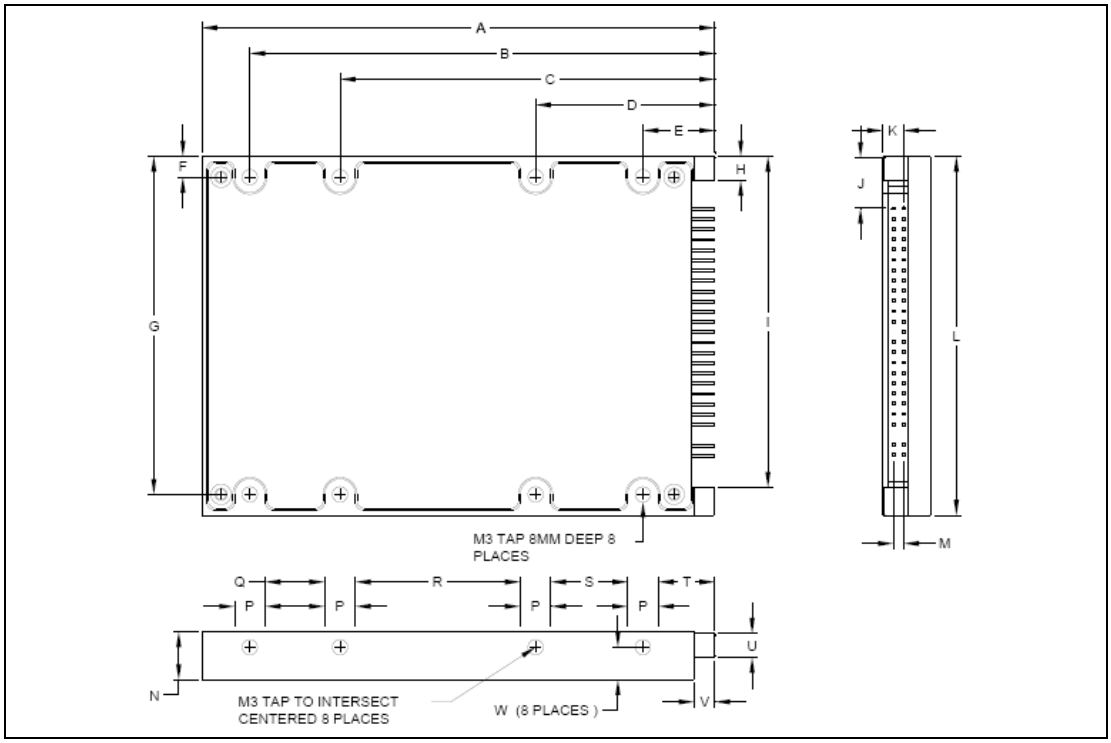

Figure 1: Physical Dimensions

Dimension	Millimeters	Tolerance (mm)
A	100.00	±0.25
B	90.60	±0.125
C	73.03	±0.125
D	34.93	±0.125
E	14.00	±0.125
F	4.08	±0.125
G	61.70	±0.125
H	4.68	±0.125
I	64.42	±0.125
J	10.14	±0.51
K	3.99	±0.43

Dimension	Millimeters	Tolerance (mm)
L	69.85	±0.25
M	2.00	±0.125
N	9.40	±0.10
P	6.00	±0.125
Q	11.57	±0.125
R	32.10	±0.125
S	14.93	±0.125
T	11.00	±0.125
U	4.65	±0.125
V	4.00	±0.125
W	6.15	±0.125

PIN LOCATIONS

The following diagram identifies the pin locations of the 2.5" PATA Drive.

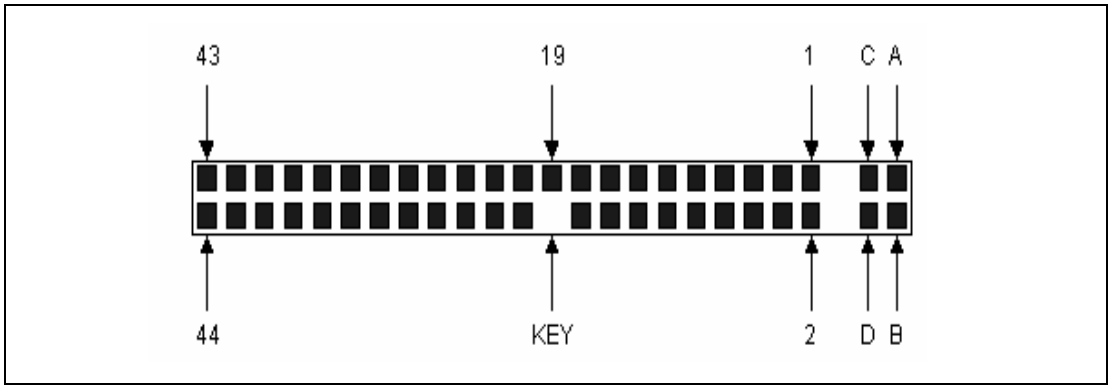

Figure 2: Pin Locations

JUMPER SETTINGS

The following diagram defines the SiliconDrive III 2.5" PATA Drive jumper settings.

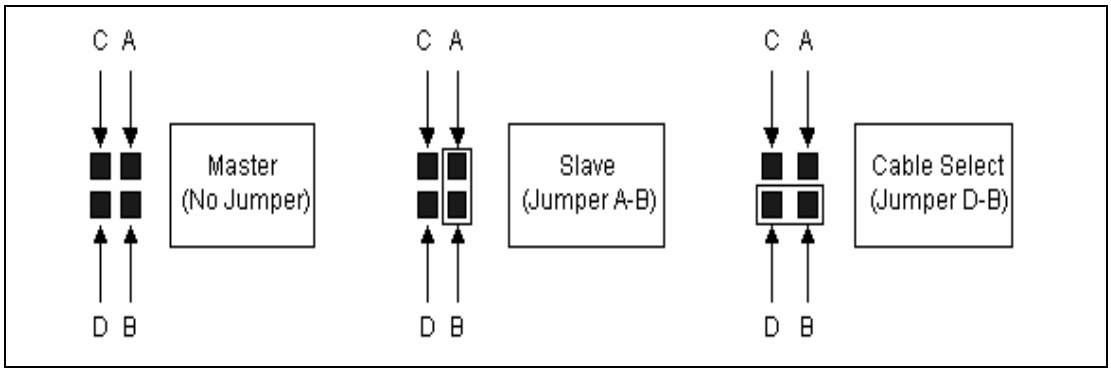

Figure 3: Jumper Settings

PRODUCT SPECIFICATIONS

Note: All SiliconDrive III 2.5" PATA Drive values quoted are typical at 25°C and nominal supply voltage.

SYSTEM PERFORMANCE

Table 1: System Performance

Read Transfer Rate (Typical)	Up to 100MBps
Write Transfer Rate (Typical)	Up to 80MBps
Burst Transfer Rate	100MBps
Reset to Ready Startup Time	300ms
Controller Overhead (Command to DRQ)	<20ms (Typical)

SYSTEM POWER REQUIREMENTS

Table 2: System Power Requirements

DC Input Voltage	5.0 ± 10%
Sleep (Standby)	0.5W
Read (Peak)	1W
Write (Peak)	1W

RELIABILITY

Table 3: Reliability

MTBF (@ 25ºC)	3,000,000 hours
Bit Error Rate	Bit Error Rate: <1 non-recoverable error in 10^{16} bits read
Data Retention	10 years

PROJECTED OPERATIONAL LIFE SPAN

Table 4: Operational Life Span

SiliconDrive Part#	Capacity	Service Life*		GB Written per Day
SSD-D0120Px-5000	120GB	19.5 Years	@	1687.5GB
SSD-D0090Px-5000	90GB	14.6 Years	@	1687.5GB
SSD-D0060Px-5000	60GB	9.7 Years	@	1687.5GB
SSD-D0030Px-5000	30GB	4.9 Years	@	1687.5GB

* There are unlimited read cycles. Service life is determined using SiliconSystems' LifeEST calculation at 100% duty cycle with 25% write cycles.

LifeEST is a comprehensive measurement that considers numerous factors to determine the projected life span of a SiliconDrive. A white paper that describes the benefits of LifeEST and how to calculate it can be found at http://www.siliconsystems.com/resources/Documents/Whitepaper/SiliconSystems_NAND_Evolution.pdf.

The actual life of a SiliconDrive is dependant on the customer usage model. SiSMART is a patented technology of SiliconSystems that enables host systems to monitor actual usage of a SiliconDrive in real time. SiSMART measures and reports the remaining life of a SiliconDrive. For more information on SiSMART, refer to the *Eliminating Unscheduled Downtime by Forecasting Useable Life* white paper at http://www.siliconsystems.com/technology/pdfs/SiliconDrive_SiSMART.pdf.

PRODUCT CAPACITY SPECIFICATIONS

Table 5: Product Capacity Specifications

Product Capacity	Capacity (Bytes)	Number of Sectors
30GB	30,000,000,000	58,626,288
60GB	60,000,000,000	117,231,408
90GB	90,000,000,000	175,836,528
120GB	120,000,000,000	234,441,648

ENVIRONMENTAL SPECIFICATIONS

Table 6: Environmental Specifications

Temperature	0ºC to 70ºC (Commercial) -40ºC to 85ºC (Industrial)
Humidity	8% to 95% non-condensing
Vibration	16.3gRMS, MIL-STD-810F, Method 514.5, Procedure I, Category 24
Shock	1000G, Half-sine, 0.5ms Duration 50g Pk, MIL-STD-810F, Method 516.5, Procedure I
Altitude	80,000ft, MIL-STD-810F, Method 500.4, Procedure II

SIGNAL DESCRIPTIONS AND PIN ASSIGNMENTS

For 2.5" PATA Drive signal descriptions and pin assignments, refer to the *Supplemental ATA Specifications* document (http://www.siliconsystems.com/resources/documents/datasheets/003M-00DPR.pdf).

ABSOLUTE MAXIMUM RATINGS

Table 7: Absolute Maximum Ratings

Symbol	Parameter	Minimum	Maximum	Units
T_S	Storage Temperature	-55	125	°C
T_A	Operating Temperature	-40	85	°C
V_{CC}	V_{CC} with Respect to GND	-0.5	V_{CC} + 0.5	V
V_{IN}	Input Voltage	-0.3	V_{CC} + 0.3	V

DC CHARACTERISTICS

Table 8: DC Characteristics

Symbol	Parameter	5V ± 10%		Units
		Minimum	Maximum	
I_{LI}	Input Leakage Current	-	10	µA
I_{LO}	Output Leakage Current	-	10	µA
I_{CCR}	I_{CC} Read Current	-	200	mA
I_{CCW}	I_{CC} Write Current	-	200	mA
I_{CCS}	I_{CC} Standby Current	-	100	mA
V_{IL}	Input Low Voltage	-	0.8	V
V_{IH}	Input High Voltage	2.0	5.5	V
V_{OL}	Output Low Voltage	-	0.5	V
V_{OH}	Output High Voltage	2.4	-	V

AC CHARACTERISTICS

For 2.5" PATA Drive AC characteristics, refer to the *Supplemental ATA Specifications* document (http://www.siliconsystems.com/resources/documents/datasheets/003M-00DPR.pdf).

ATA COMMANDS

The following table specifies which commands are supported by SiliconDrive III. Refer to the *ATA-6* specification for more information on the commands.

Table 9: ATA Commands

Command	Command Code	Supported?
NOP	00h	Yes
CFA REQUEST EXTENDED ERROR	03h	No
DEVICE RESET	08h	No
READ SECTOR(S)	20h	Yes
READ SECTOR(S) EXT	24h	No
READ DMA EXT	25h	No
READ DMA QUEUED EXT	26h	No
READ NATIVE MAX ADDRESS EXT	27h	No
READ MULTIPLE EXT	29h	No
READ LOG EXT	2Fh	No
WRITE SECTOR(S)	30h	Yes
WRITE SECTOR(S) EXT	34h	No
WRITE DMA EXT	35h	No
WRITE DMA QUEUED EXT	36h	No
SET MAX ADDRESS EXT	37h	No
CFA WRITE SECTORS W/OUT ERASE	38h	No
WRITE MULTIPLE EXT	39h	No
WRITE LOG EXT	3Fh	No
READ VERIFY SECTOR(S)	40h	Yes
READ VERIFY SECTOR(S) EXT	42h	No
SEEK	70h	Yes
CFA TRANSLATE SECTOR	87h	No
EXECUTE DEVICE DIAGNOSTIC	90h	Yes
DOWNLOAD MICROCODE	92h	No
PACKET	A0h	No
IDENTIFY PACKET DEVICE	A1h	No
SERVICE	A2h	No

Table 9: ATA Commands (Continued)

Command	Command Code	Supported?
SMART DISABLE OPERATIONS	B0h	Yes
SMART ENABLE/DISABLE AUTOSAVE	B0h	Yes
SMART ENABLE OPERATIONS	B0h	Yes
SMART EXECUTE OFF_LINE	B0h	Yes
SMART READ DATA	B0h	Yes
SMART READ LOG SECTOR	B0h	Yes
SMART RETURN STATUS	B0h	Yes
SMART WRITE LOG SECTOR	B0h	Yes
DEVICE CONFIGURATION FREEZE LOCK	B1h	No
DEVICE CONFIGURATION IDENTIFY	B1h	No
DEVICE CONFIGURATION RESTORE	B1h	No
DEVICE CONFIGURATION SET	B1h	No
CFA ERASE SECTORS	C0h	No
READ MULTIPLE	C4h	Yes
WRITE MULTIPLE	C5h	Yes
SET MULTIPLE MODE	C6h	Yes
READ DMA QUEUED	C7h	No
READ DMA	C8h	Yes
WRITE DMA	CAh	Yes
WRITE DMA QUEUED	CCh	No
CFA WRITE MULTIPLE W/OUT ERASE	CDh	No
CHECK MEDIA CARD TYPE	D1h	No
GET MEDIA STATUS	DAh	No
MEDIA LOCK	DEh	No
MEDIA UNLOCK	DFh	No
STANDBY IMMEDIATE	E0h	Yes
IDLE IMMEDIATE	E1h	Yes
STANDBY	E2h	Yes
IDLE	E3h	Yes
READ BUFFER	E4h	Yes
CHECK POWER MODE	E5h	Yes

Table 9: ATA Commands (Continued)

Command	Command Code	Supported?
SLEEP	E6h	Yes
FLUSH CACHE	E7h	Yes
WRITE BUFFER	E8h	Yes
FLUSH CACHE EXT	EAh	No
IDENTIFY DEVICE	ECh	Yes
MEDIA EJECT	EDh	No
SET FEATURES	EFh	Yes
SECURITY SET PASSWORD	F1h	Yes
SECURITY UNLOCK	F2h	Yes
SECURITY ERASE PREPARE	F3h	Yes
SECURITY ERASE UNIT	F4h	Yes
SECURITY FREEZE LOCK	F5h	Yes
SECURITY DISABLE PASSWORD	F6h	Yes
READ NATIVE MAX ADDRESS	F8h	No
SET MAX ADDRESS	F9h	Yes

IDENTIFY DEVICE INFORMATION

The information in the following table is returned upon issuing an IDENTIFY DEVICE command to the SiliconDrive III. Fields marked as Reserved or Obsolete in the ATA-6 specification are omitted in this table.

Table 10: IDENTIFY DEVICE Information

Word	Value		Description
0	045Ah		General configuration bit-significant information:
		15	0 = ATA device
		7	0 = Fixed device
		2	Response is incomplete
2	C837h	-	Specific configuration
23-26	XXXXh	-	Firmware revision (eight ASCII characters)
27-46	XXXXh	-	Model number (40 ASCII characters)
47	8001h		Multiple count:
		15-8	80h
		7-0	00h = Reserved
		-	01h-10h = Maximum number of sectors that shall be transferred per interrupt on READ/ WRITE MULTIPLE commands
		-	11h-FFh = Reserved
49	0F00h		Capabilities:
		13	0 = Standby timer values shall be managed by the device
		11	1 = IORDY is supported
		10	1 = IORDY may be disabled
		9	Shall be set to 1
		8	1 = DMA is supported
50	4000h		Capabilities:
		15	Shall be cleared to 0
		14	Shall be set to 1
		0	Shall be set to one to indicate a device specific Standby timer value minimum

Table 10: IDENTIFY DEVICE Information (Continued)

Word	Value		Description
53	0007h		Field validity:
		2	1 = Fields reported in word 88 are valid
		1	1 = Fields reported in words 64-70 are valid
59	0101h		
		8	1 = Multiple sector setting is valid
		7-0	Xxh = Current setting for number of sectors that shall be transferred per interrupt on R/W Multiple command
60-61	XXXXh	-	Total number of user addressable sectors
63	XXX7h		
		10	1/0 = Multiword DMA mode 2 is selected/not selected
		9	1/0 = Multiword DMA mode 1 is selected/not selected
		8	1/0 = Multiword DMA mode 0 is selected/not selected
		2	1 = Multiword DMA mode 2 and below are supported
		1	1 = Multiword DMA mode 1 and below are supported
		0	1 = Multiword DMA mode 0 is supported
64	0003h	7-0	PIO modes supported
65	0078h		Minimum Multiword DMA transfer cycle time per word:
		15-0	Cycle time in nanoseconds
66	0078h		Manufacturer’s recommended Multiword DMA transfer cycle time:
		15-0	Cycle time in nanoseconds
67	0078h		Minimum PIO transfer cycle time without flow control:
		15-0	Cycle time in nanoseconds
68	0078h		Minimum PIO transfer cycle time with IORDY flow control:
		15-0	Cycle time in nanoseconds

Table 10: IDENTIFY DEVICE Information (Continued)

Word	Value		Description
75	0000h		Queue depth:
		4-0	Maximum queue depth -1
80	0070h		Major version number:
		-	0000h or FFFFh = Device does not report version
		6	1 = Supports ATA/ATAPI-6
		5	1 = Supports ATA/ATAPI-5
		4	1 = Supports ATA/ATAPI-4
		3	0 = Does not support ATA-3
81	0000h		Minor version number:
		-	0000h or FFFFh = device does not report version
82	7008h		Command set supported:
		14	1 = NOP command is supported
		13	1 = READ BUFFER command is supported
		12	1 = WRITE BUFFER command is supported
		10	0 = Host Protected Area feature set is not supported
		9	0 = DEVICE RESET command is not supported
		8	0 = SERVICE interrupt is not supported
		7	0 = Release interrupt is not supported
		6	0 = Look-ahead is not supported
		5	0 = Write cache is not supported
		4	Shall be cleared to 0 to indicate that the PACKET Command feature set is not supported
		3	1 = Mandatory Power Management feature set is supported
		2	0 = Does not support Removable Media feature set
		1	0 = Does not support Security Mode feature set
		0	0 = Does not support SMART feature set

Table 10: IDENTIFY DEVICE Information (Continued)

Word	Value		Description
83	5000h		Command sets supported:
		15	Shall be cleared to 0
		14	Shall be set to 1
		13	0 = FLUSH CACHE EXT command is not supported
		12	1 = Mandatory FLUSH CACHE command is supported
		11	0 = Device Configuration Overlay feature set is not supported
		10	0 = 48-bit Address feature set is not supported
		9	0 = Automatic Acoustic Management feature set is not supported
		8	0 = SET MAX security extension is not supported
		7	See Address Offset Reserved Area Boot, NCITS TR27:2001
		6	0 = SET FEATURES subcommand is not required to spinup after power-up
		5	0 = Power-Up In Standby feature set is not supported
		4	0 = Removable Media Status Notification feature set is not supported
		3	0 = Advanced Power Management feature set is not supported
		2	0 = CFA feature set is not supported
		1	0 = READ/WRITE DMA QUEUED is not supported
		0	0 = DOWNLOAD MICROCODE command is not supported

Table 10: IDENTIFY DEVICE Information (Continued)

Word	Value		Description
84	4000h		Command set/feature supported extension:
		15	Shall be cleared to 0
		14	Shall be set to 1
		5	0 = General Purpose Logging feature set is not supported
		3	0 = Media Card Pass Through Command feature set is not supported
		2	0 = Media serial number is not supported
		1	0 = SMART self-test is not supported
		0	0 = SMART error logging is not supported
85	7000h		Command set/feature enabled:
		14	1 = NOP command is enabled
		13	1 = READ BUFFER command is enabled
		12	1 = WRITE BUFFER command is enabled
		10	0 = Host Protected Area feature set is disabled
		9	0 = DEVICE RESET command is disabled
		8	0 = SERVICE interrupt is disabled
		7	0 = Release interrupt is disabled
		6	0 = Look-ahead is disabled
		5	0 = Write cache is disabled
		4	Shall be cleared to 0 to indicate that the PACKET Command feature set is not supported
		3	0 = Power Management feature set is disabled
		2	0 = Removable Media feature set is disabled
		1	0 = Security Mode feature set is disabled
		0	0 = SMART feature set is disabled

Table 10: IDENTIFY DEVICE Information (Continued)

Word	Value		Description
86	1000h		Command set/feature enabled:
		13	0 = FLUSH CACHE EXT command is not supported
		12	1 = FLUSH CACHE command is supported
		11	0 = Device Configuration Overlay is not supported
		10	0 = 48-bit Address features set is not supported
		9	0 = Automatic Acoustic Management feature set is disabled
		8	0 = SET MAX security extension is disabled by SET MAX SET PASSWORD
		7	See Address Offset Reserved Area Boot, NCITS TR27:2001
		6	0 = SET FEATURES subcommand is not required to spin-up after power-up
		5	0 = Power-Up In Standby feature set is disabled
		4	0 = Removable Media Status Notification feature set is disabled
		3	0 = Advanced Power Management feature set is disabled
		2	0 = CFA feature set is disabled
		1	0 = READ/WRITE DMA QUEUED command is not supported
		0	0 = DOWNLOAD MICROCODE command is not supported

Table 10: IDENTIFY DEVICE Information (Continued)

Word	Value		Description
87	4000h		Command set/feature default:
		15	Shall be cleared to 0
		14	Shall be set to 1
		5	0 = General Purpose Logging feature set is not supported
		3	0 = Media Card Pass Through Command feature set is disabled
		2	0 = Media serial number is invalid
		1	0 = SMART self-test is not supported
		0	0 = SMART error logging is not supported
88	XX3Fh		
		13	1/0 = UDMA mode 5 is selected/not selected
		12	1/0 = UDMA mode 4 is selected/not selected
		11	1/0 = UDMA mode 3 is selected/not selected
		10	1/0 = UDMA mode 2 is selected/not selected
		9	1/0 = UDMA mode 1 is selected/not selected
		8	1/0 = UDMA mode 0 is selected/not selected
		5	1 = Ultra DMA mode 5 and below are supported
		4	1 = Ultra DMA mode 4 and below are supported
		3	1 = Ultra DMA mode 3 and below are supported
		2	1 = Ultra DMA mode 2 and below are supported
		1	1 = Ultra DMA mode 1 and below are supported
		0	1 = Ultra DMA mode 0 is supported
89	0000h	-	Time required for security erase unit completion
90	0000h	-	Time required for Enhanced security erase completion
91	0000h	-	Current advanced power management value
92	0000h	-	Master Password Revision Code

Table 10: IDENTIFY DEVICE Information (Continued)

Word	Value		Description
94	0000h		
		15-8	Vendor's recommended acoustic management value
		7-0	Current automatic acoustic management value
100-103	0000h 0000h 0000h 0000h	-	Maximum user LBA for 48-bit Address feature set
127	0000h	1-0	00 = Removable Media Status Notification feature set is not supported
128	0000h		Security status:
		8	Security level 0 = High
		5	0 = Enhanced security erase is not supported
		4	0 = Security count is not expired
		3	0 = Security is not frozen
		2	0 = Security is unlocked
		1	0 = Security is disabled
		0	0 = Security is not supported

ATA SPECIFICATIONS

Supplemental ATA Specifications can be found in the *Supplemental ATA Specifications* document (http://www.siliconsystems.com/resources/documents/datasheets/003M-00DPR.pdf).

SALES AND SUPPORT

To order or obtain information on pricing and delivery, contact your SiliconSystems Sales Representative.

PART NUMBERING

NOMENCLATURE

The following table defines the SiliconDrive III 2.5" PATA Drive part numbering scheme.

SSD- (Product Family)	D (Form Factor)	YYYY (Capacity)	X (Interface)	X (Temperature)	-5000 (Part Number Suffix)
				• C = 0°C – 70°C • I = -40°C – 85°C	
			P = PATA		
		Whole Numbers Represent Gigabytes: • 0001 = 1GB • 1000 = 1TB • 256M = 256MB • 512M = 512MB			
	D = 2.5" Drive				
SSD- = SiliconDrive					

PART NUMBERS

The following table lists the SiliconDrive III part numbers.

Table 11: Part Numbers

Part Number	Capacity
SSD-D0120P(x)-5000	120GB
SSD-D0090P(x)-5000	90GB
SSD-D0060P(x)-5000	60GB
SSD-D0030P(x)-5000	30GB

ROHS 6 OF 6 PRODUCT LABELING — PB-FREE IDENTIFICATION LABEL

The Pb-free identification label indicates that the enclosed components/ devices and/or assemblies do not contain any lead (i.e., they are lead-free, as defined in RoHS directive 2002/95/ED). The above symbol is on all RoHS 6 of 6 compliant product labels, as seen in Figure 4.

SAMPLE LABEL

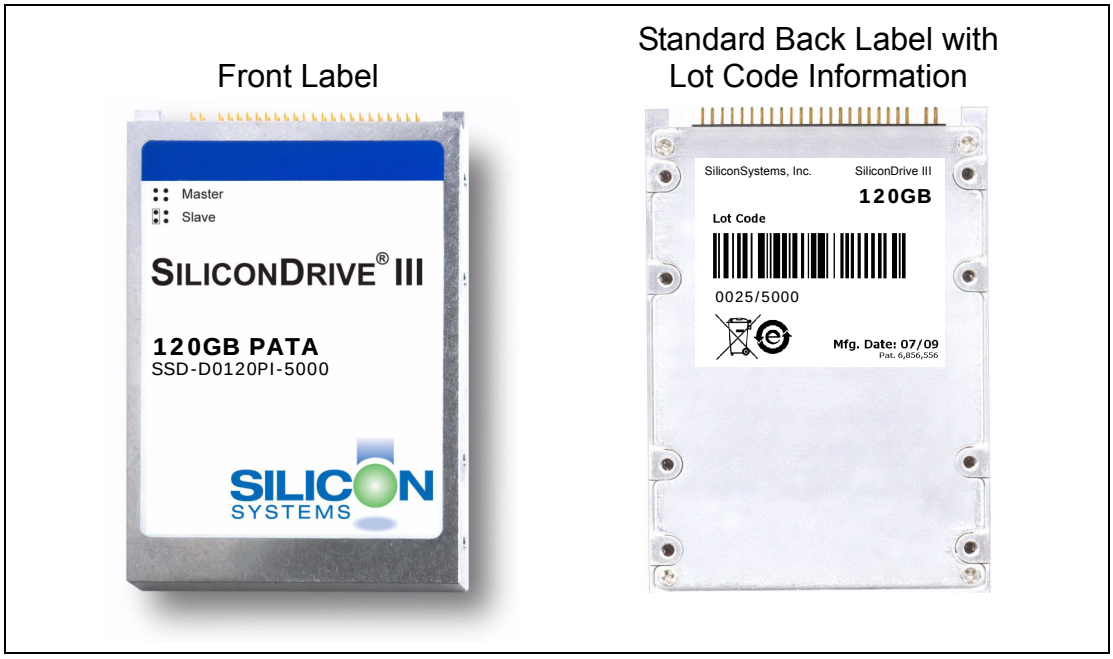

Figure 4: Sample Label

RELATED DOCUMENTATION

For more information, visit www.siliconsystems.com or contact your SiliconSystems Sales Representative.

Table 12: Related Documentation

SiliconDrive III Application-Specific Technology	Description	Document
ATA Specification Reference Document	Supplemental ATA specification information.	*Supplemental ATA Specifications* (http://www.siliconsystems.com/resources/documents/datasheets/003M-00DPR.pdf)
PowerArmor	Eliminates drive corruption.	*Eliminating Drive Corruption from Power Disturbances White Paper* (http://www.siliconsystems.com/technology/pdfs/SiliconDrive_PowerArmor.pdf)
SiSMART	Calculates remaining useful life.	• *SISMART ATA Command Interface Application Note* (http://www.siliconsystems.com/resources/documents/appnote/SSAN00-SiSMART-R.pdf) • *Eliminating Unscheduled Downtime by Forecasting Solid State Drive (SSD) Useable Life White Paper* (http://www.siliconsystems.com/technology/pdfs/SiliconDrive_SiSMART.pdf)