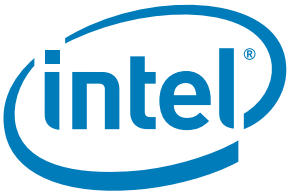


Intel® Solid-State Drive 711 Series

Product Specification

- Capacity: 32 GB, 64 GB
- Components:
  - — Intel® 34nm NAND Flash Memory
  - — Single-Level Cell (SLC)
- Form Factor: 2.5-inch
- Read and Write IOPS (Full LBA Range, Iometer* Queue Depth 32)
  - — Random 4 KB Reads: Up to 45,000 IOPS
  - — Random 4 KB Writes: Up to 5,500 IOPS
- Bandwidth Performance
  - — Sustained Sequential Read: Up to 250 MB/s
  - — Sustained Sequential Write[1]: Up to 230 MB/s
- Latency (average sequential)
  - — Read: 60 µs (TYP)
  - — Write: 65 µs (TYP)
- Compatibility
  - — Intel® SSD Toolbox with Intel® SSD Optimizer
  - — Intel® Data Migration Software
  - — Intel® Rapid Storage Technology
  - — Intel® 6 Series Express Chipsets (with SATA 6Gb/s)
  - — SATA Revision 2.6; compatible with SATA 1.5Gb/s and 3Gb/s interface rates
  - — ATA/ATAPI-7
  - — SSD-enhanced SMART ATA feature set
  - — Native Command Queuing (NCQ) command set
  - — Data set management command Trim attribute
- Power Management
  - — 5 V SATA Supply Rail
  - — SATA Interface Power Management
  - — OS-aware hot plug/removal
- Power
  - — Active: Up to 3 W (TYP)
  - — Idle[2]: 75 mW
- Weight: 76 ±2 grams
- Temperature
  - — Operating: 0^{o} C to 70^{o} C
  - — Non-Operating: -55^{o} C to 95^{o} C
- Shock (operating and non-operating): 1,500 G/0.5 msec
- Vibration
  - — Operating: 2.17 G_{RMS} (5-700 Hz)
  - — Non-operating: 3.13 G_{RMS} (5-800 Hz)
- Reliability
  - — Uncorrectable Bit Error Rate (UBER): 1 sector per 10^{16} bits read
  - — Mean Time Between Failures (MTBF): 2,000,000 hours
- Endurance Rating (4 KB):
  - — 32 GB: 1.0 PB
  - — 64 GB: 2.0 PB
- Certifications and Declarations
  - — UL*, CE*, C-Tick*, BSMI*, KCC*, Microsoft* WHQL, VCCI*, SATA-IO*
- Product Ecological Compliance
  - — RoHS*

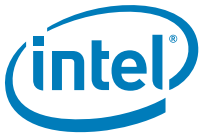
1. Performance values vary by capacity.
2. Idle power measured with Device Initiated Power Management (DIPM) enabled.

Order Number: 325924-001US
October 2011

Ordering Information

Contact your local Intel sales representative for ordering information.

Contents



1.0 Overview

This document describes the specifications and capabilities of the Intel® Solid-State Drive 711 Series (Intel® SSD 711 Series).

The Intel SSD 711 Series delivers leading performance for Serial Advanced Technology Attachment (SATA)-based computers in two capacities: 32 GB and 64 GB.

By combining 34nm Intel® NAND Flash Memory single-level cell (SLC) technology with SATA 3Gb/s interface support, the Intel SSD 711 Series delivers sequential read speeds of up to 250 MB/s and sequential write speeds of up to 230 MB/s. The Intel SSD 711 Series also delivers random read performance of up to 45,000 IOPS and random write performance of up to 5,500 IOPS.

The industry-standard 2.5-inch form factor enables interchangeability with existing hard disk drives (HDDs) and native SATA HDD drop-in replacement with the enhanced performance, reliability, ruggedness, and power savings offered by an SSD.

As compared to standard SATA HDDs, the Intel SSD 711 Series offers these key features:

- SLC NAND technology
- High I/O and throughput performance
- Low power
- Increased system responsiveness
- High reliability
- Enhanced ruggedness

2.0 Product Specifications

2.1 Capacity

Table 1. User Addressable Sectors

Intel SSD 711 Series	Unformatted Capacity (Total User Addressable Sectors in LBA Mode)
32 GB	62,533,296
64 GB	125,045,424

Notes: 1 GB = 1,000,000,000 bytes; 1 sector = 512 bytes.
LBA count shown represents total user storage capacity and will remain the same throughout the life of the drive.
The total usable capacity of the SSD may be less than the total physical capacity because a small portion of the capacity is used for NAND flash management and maintenance purposes.

2.2 Performance

Table 2. Random Read and Write Input/Output Operations Per Second (IOPS)

Specification[1]	Unit	Intel SSD 711 Series	
		32 GB	64 GB
Random 4 KB Read (up to)	IOPS	45,000	
Random 4 KB Write (up to)	IOPS	5,500	

Note: 1. Performance measured using Iometer* with Queue Depth equal to 32. Measurements performed on full LBA span of the drive. Write Cache enabled. 4 KB = 4,096 bytes.

Table 3. Maximum Sustained Sequential Read and Write Bandwidth

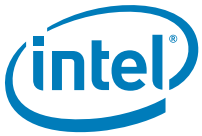
Specification[1]	Unit	Intel SSD 711 Series	
		32 GB	64 GB
Sequential Read (up to)	MB/s	250	
Sequential Write (up to)	MB/s	195	230

Note: 1. Performance measured using Iometer with 64 KB (65,536 bytes) of transfer size with Queue Depth equal to 32. Write Cache enabled. MB/s = 1,000,000 bytes per second.

Table 4. Latency

Specification[1]	Intel SSD 711 Series	
	32 GB	64 GB
Latency Read Write Power On to Ready[2]	 60 µs (TYP) 65 µs (TYP) 1.5 s (TYP)	

Notes:
1. Device measured using Iometer. Latency measured using 4 KB (4,096 bytes) transfer size with Queue Depth equal to 1. Write Cache enabled.
2. Power On To Ready time assumes proper shutdown.



2.3 Electrical Characteristics

Table 5. Operating Voltage and Power Consumption

Electrical Characteristics	Intel SSD 711 Series	
	32 GB	64 GB
Operating Voltage for 5 V (± 5%) Min Max	4.75 V 5.25 V	
Power Consumption (Typical) Active[1] Idle[2]	Up to 3 W 75 mW	

Notes:
1. The workload equates 64 KB (65,536 bytes) Queue Depth equal to 32 sequential writes. Root Mean Squared (RMS) power is measured using scope trigger over a 100 ms sample period.
2. Idle power measured with Device Initiated Power Management (DIPM) enabled.

2.4 Environmental Conditions

Table 6. Temperature, Shock, Vibration

Temperature	Range
Case Temperature Operating Non-operating[1]	 0 – 70 °C -55 – 95 °C
Temperature Gradient[2] Operating Non-operating	 20 (Typical) °C/hr 30 (Typical) °C/hr
Humidity Operating Non-operating	 5 – 95 % 5 – 95 %
Shock and Vibration	**Range**
Shock[3] Operating Non-operating	 1,500 G (Max) at 0.5 msec 1,500 G (Max) at 0.5 msec
Vibration[4] Operating Non-operating	 2.17 G_{RMS} (5-700 Hz) Max 3.13 G_{RMS} (5-800 Hz) Max

Notes:
1. Non-operating temperature specification does not include data retention.
2. Temperature gradient measured without condensation.
3. Shock specifications assume the SSD is mounted securely with the input vibration applied to the drive-mounting screws. Stimulus may be applied in the X, Y or Z axis. Shock specification is measured using Root Mean Squared (RMS) value.
4. Vibration specifications assume the SSD is mounted securely with the input vibration applied to the drive-mounting screws. Stimulus may be applied in the X, Y or Z axis. Vibration specification is measured using RMS value.

2.5 Product Regulatory Compliance

The Intel SSD 711 Series meets or exceeds the regulatory or certification requirements in Table 7.

Table 7. Product Regulatory Compliance Specifications

Title	Description	Region for which conformity declared
Australia/New Zealand ACMA AS/NZS options: CISPR 22:2006, amendment A1:2007 to EN 55022:2006 and amendment 1 to CISPR 22:2005 (Edition 5)	EMC regulations for ITE equipment	Australia/ New Zealand
ICES-003 Issue 4	Interference Causing Equipment Standard	Canada
European Union Low Voltage Directive (LVD) 2006/95/EC	EN 60950-1 2nd edition for Information Technology Equipment - Safety - Part 1: General Requirements	European Union
EN 55022:2006	Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement	European Union
EN 55024:1998	Information technology equipment - Immunity characteristics - Limits and methods of measurement (CISPR 24:1997, modified)	European Union
CISPR 22:2006	Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement	International
VCCI V3/2010.04	Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement	Japan
KN22 (2008-5)	Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement	Korea
KN24 (2008-5)	Information technology equipment - Immunity characteristics - Limits and methods of measurement (CISPR 24:1997, modified)	Korea
CNS 14348:2006	Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement	Taiwan
UL/CSA 60950-1, Second Edition CAN/CSA-C22.2 No. 60950-1-07 Second Edition	Information Technology Equipment - Safety - Part 1: General Requirements	USA/Canada
CFR Title 47 Part 15	Radio Frequency Devices - Subpart B (Unintentional Radiators)	USA

2.6 Reliability

The Intel SSD 711 Series meets SSD endurance and data retention requirements as specified in Table 8.

Table 8. Reliability Specifications

Parameter	Value
Uncorrectable Bit Error Rate (UBER) Uncorrectable bit error rate will not exceed one sector in the specified number of bits read. In the unlikely event of a nonrecoverable read error, the SSD will report it as a read failure to the host; the sector in error is considered corrupt and is not returned to the host.	1 sector in 10^{16} bits read, max
Mean Time Between Failure (MTBF) Mean Time Between Failure is estimated based on Telcordia* methodology and demonstrated through Reliability Demonstration Test (RDT).	2,000,000 hours
Power On/Off Cycles Power On/Off Cycles is defined as power being removed from the SSD, and then restored. Most host systems remove power from the SSD when entering suspend and hibernate as well as on a system shutdown.	50,000 cycles
Insertion Cycles SATA/power cable insertion/removal cycles.	250 insertion/removal cycles
Data Retention The time period for retaining data in the NAND at maximum rated endurance.	3 months power-off retention at 40 °C once SSD reaches rated write endurance
Endurance Rating The SSD will be able to write host data equal to the lifetime endurance specification.	See Section 2.7, "Write Endurance"

2.7 Write Endurance

Write endurance is measured while running 100% random 4 KB (4,096 bytes) writes spanning 100% of the drive using Iometer.

Table 9. Write Endurance Specifications

Intel SSD 711 Series	4 KB Writes
32 GB	1 PB
64 GB	2 PB

2.8 Hot Plug Support

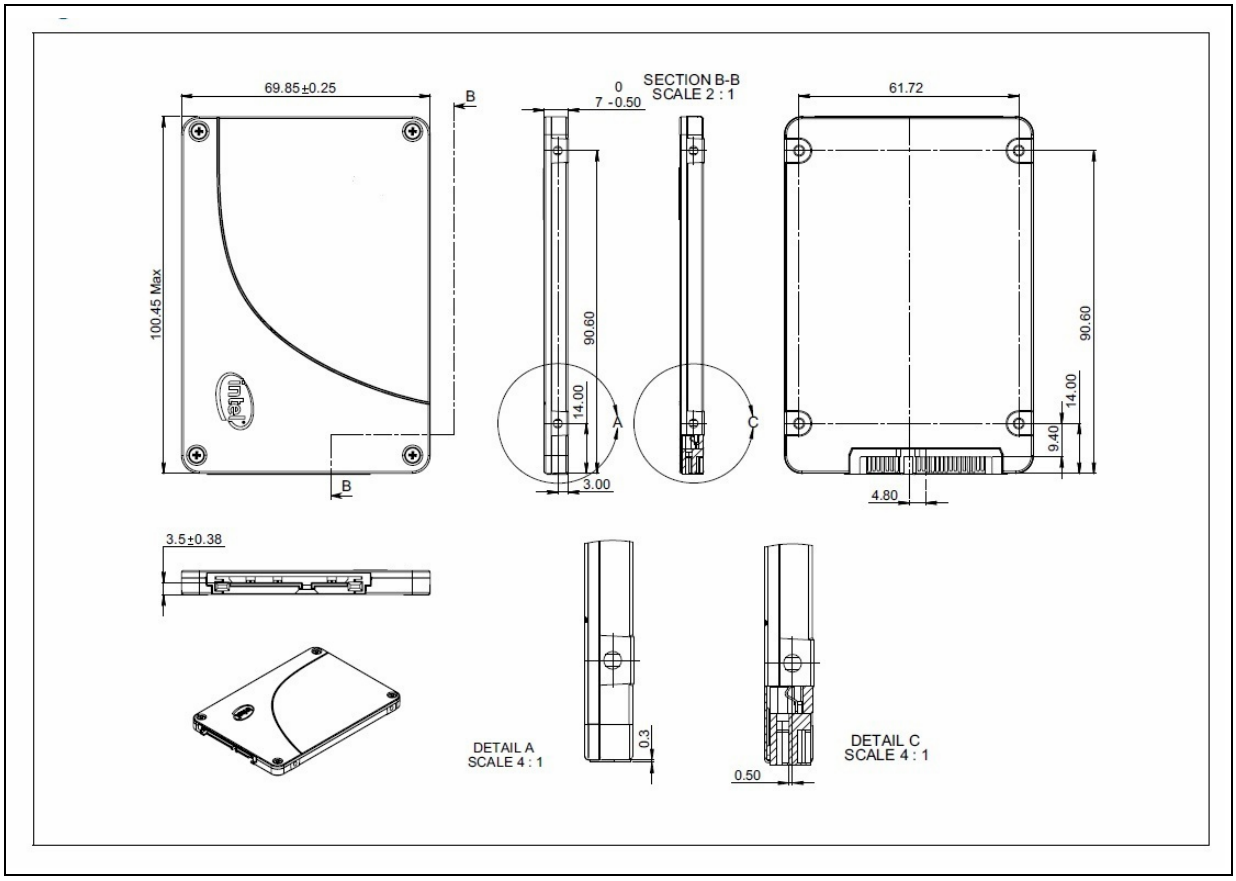
Hot Plug insertion and removal is supported in the presence of a proper connector and appropriate operating system (OS), as described in the SATA 2.6 specification.

This product supports asynchronous signal recovery and issues an unsolicited COMINIT when first mated with a powered connector to guarantee reliable detection by a host system without hardware device detection.

3.0 Mechanical Information

Figure 1 shows the physical package information for the Intel SSD 711 Series. All dimensions are in millimeters.

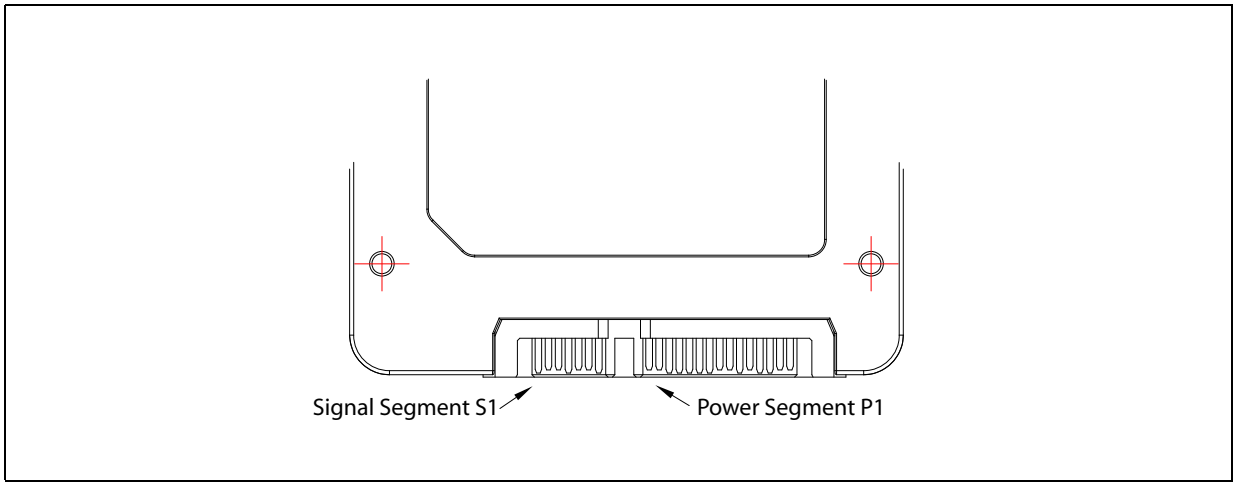
Figure 1. Intel SSD 711 Series Dimensions (7mm Z-height)



4.0 Pin and Signal Descriptions

4.1 Pin Locations

Figure 2. Layout of Signal and Power Segment Pins



Note: 2.5-inch connector supports in-built latching capability.

4.2 Signal Descriptions

4.2.1 Connector Pin Signal Definitions

Table 10. Serial ATA Connector Pin Signal Definitions

Pin	Function	Definition
S1	Ground	1st mate
S2	A+	Differential signal pair A
S3	A-	
S4	Ground	1st mate
S5	B-	Differential signal pair B
S6	B+	
S7	Ground	1st mate

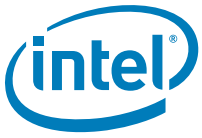
Note: Key and spacing separate signal and power segments.

4.2.2 Power Pin Signal Definitions

Table 11. Serial ATA Power Pin Definitions

Pin[1]	Function	Definition	Mating Order
P1[2]	Not connected	(3.3 V Power)	
P2[2]	Not connected	(3.3 V Power)	
P3[2]	Not connected	(3.3 V Power; pre-charge)	2nd Mate
P4[3,4]	Ground		1st Mate
P5[3]	Ground		1st Mate
P6[3]	Ground		1st Mate
P7[3,5]	V_5	5 V Power	1st Mate
P8[3,5]	V_5	5 V Power	2nd Mate
P9[3,5]	V_5	5 V Power	2nd Mate
P10[3]	Ground		1st Mate
P11[6]	DAS	Device Activity Signal	2nd Mate
P12[3, 4]	Ground		1st Mate
P13[7]	V_{12}	12 V Power; not used	1st Mate
P14[7]	V_{12}	12 V Power; not used	2nd Mate
P15[7]	V_{12}	12 V Power; not used	2nd Mate

Notes:
1. All pins are in a single row, with a 1.27 mm (0.050-inch) pitch.
2. Pins P1, P2 and P3 are connected together, although they are not connected internally to the device. The host may put 3.3 V on these pins.
3. The mating sequence is:
   - the ground pins P4-P6, P10, P12 and the 5V power pin P7.
   - the signal pins and the rest of the 5V power pins P8-P9.
4. Ground connectors P4 and P12 may contact before the other 1st mate pins in both the power and signal connectors to discharge ESD in a suitably configured backplane connector.
5. Power pins P7, P8, and P9 are internally connected to one another within the device.
6. The host may ground P11 if it is not used for Device Activity Signal (DAS).
7. Pins P13, P14 and P15 are connected together, although they are not connected internally to the device. The host may put 12 V on these pins.



5.0 Supported Command Sets

The Intel SSD 711 Series supports all the mandatory ATA (Advanced Technology Attachment) commands defined in the ATA8-ACS specification described in this section.

5.1 ATA General Feature Command Set

The Intel SSD 711 Series supports the ATA General Feature command set (non-PACKET), which consists of:

- EXECUTE DEVICE DIAGNOSTIC
- FLUSH CACHE
- IDENTIFY DEVICE

  Note: See Appendix A, "IDENTIFY DEVICE Command Data" on page 23 for details on the sector data returned after issuing an IDENTIFY DEVICE command.
- READ DMA
- READ SECTOR(S)
- READ VERIFY SECTOR(S)
- SEEK
- SET FEATURES
- WRITE DMA
- WRITE SECTOR(S)
- READ MULTIPLE
- SET MULTIPLE MODE
- WRITE MULTIPLE

The Intel SSD 711 Series also supports the following optional commands:

- READ BUFFFER
- WRITE BUFFER
- NOP
- DOWNLOAD MICROCODE

5.2 Power Management Command Set

The Intel SSD 711 Series supports the Power Management command set, which consists of:

- CHECK POWER MODE
- IDLE
- IDLE IMMEDIATE
- SLEEP
- STANDBY
- STANDBY IMMEDIATE

5.3 Security Mode Feature Set

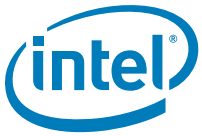
The Intel SSD 711 Series supports the Security Mode command set, which consists of:

- SECURITY SET PASSWORD
- SECURITY UNLOCK
- SECURITY ERASE PREPARE
- SECURITY ERASE UNIT
- SECURITY FREEZE LOCK
- SECURITY DISABLE PASSWORD

5.4 SMART Command Set

The Intel SSD 711 Series supports the SMART command set, which consists of:

- SMART READ DATA
- SMART READ ATTRIBUTE THRESHOLDS
- SMART ENABLE/DISABLE ATTRIBUTE AUTOSAVE
- SMART SAVE ATTRIBUTE VALUES
- SMART EXECUTE OFF-LINE IMMEDIATE
- SMART READ LOG SECTOR
- SMART WRITE LOG SECTOR
- SMART ENABLE OPERATIONS
- SMART DISABLE OPERATIONS
- SMART RETURN STATUS
- SMART ENABLE/DISABLE AUTOMATIC OFFLINE



5.4.1 SMART Attributes

Table 12 lists the SMART attributes supported by the Intel SSD 711 Series and the corresponding status flags and threshold settings.

Table 12. SMART Attributes

ID	Attribute	Status Flags[1]						Threshold
		SP	EC	ER	PE	OC	PW	
03h	Spin Up Time Reports a fixed value of zero (0).	1	0	0	0	0	0	0 (none)
04h	Start/Stop Count Reports a fixed value of zero (0).	1	1	0	0	0	0	0 (none)
05h	Re-allocated Sector Count The raw value of this attribute shows the number of retired blocks since leaving the factory (grown defect count).	1	1	0	0	1	0	0 (none)
09h	Power-On Hours Count Reports the cumulative number of power-on hours over the life of the device. However, the On/Off status of the Device Initiated Power Management (DIPM) feature will affect the number of hours reported. If DIPM is turned On, the recorded value for power-on hours does not include the time that the device is in a "slumber" state. If DIPM is turned Off, the recorded value for power-on hours should match the clock time, as all three device states are counted: active, idle and slumber.	1	1	0	0	1	0	0 (none)
0Ch	Power Cycle Count The raw value of this attribute reports the cumulative number of power cycle events over the life of the device.	1	1	0	0	1	0	0 (none)
B8h	End-to-End Error Detection Count Reports number of errors encountered during LBA tag checks, within the SSD data path.	1	1	0	0	1	1	90
C0h	Unsafe Shutdown Count The raw value of this attribute reports the cumulative number of unsafe (unclean) shutdown events over the life of the device. An unsafe shutdown occurs whenever the device is powered off without STANDBY IMMEDIATE being the last command.	1	1	0	0	1	0	0 (none)
E1h	Host Writes The raw value of this attribute reports the total number of sectors written by the host system. The raw value is increased by 1 for every 65,536 sectors (32MB) written by the host.	1	1	0	0	0	0	0 (none)
E2h	Timed Workload Media Wear Measures the wear seen by the SSD (since reset of the workload timer, attribute E4h), as a percentage of the maximum rated cycles.	0	1	0	0	1	1	0 (none)
E3h	Timed Workload Host Read/Write Ratio Shows the percentage of I/O operations that are read operations (since reset of the workload timer, attribute E4h).	0	1	0	0	1	1	0 (none)
E4h	Timed Workload Timer Measures the elapsed time (number of minutes since starting this workload timer).	0	1	0	0	1	1	0 (none)

Table 12. SMART Attributes (Continued)

ID	Attribute	Status Flags[1]						Threshold
		SP	EC	ER	PE	OC	PW	
E8h	Available Reserved Space This attribute reports the number of reserve blocks remaining. The normalized value begins at 100 (64h), which corresponds to 100 percent availability of the reserved space. The threshold value for this attribute is 10 percent availability.	1	1	0	0	1	1	10
E9h	Media Wearout Indicator This attribute reports the number of cycles the NAND media has undergone. The normalized value declines linearly from 100 to 1 as the average erase cycle count increases from 0 to the maximum rated cycles. Once the normalized value reaches 1, the number will not decrease, although it is likely that significant additional wear can be put on the device.	1	1	0	0	1	0	0 (none)

Note: 1. The following table defines the SMART Attributes status flags.

Status Flag	Description	Value = 0	Value = 1
SP	Self-preserving attribute	Not a self-preserving attribute	Self-preserving attribute
EC	Event count attribute	Not an event count attribute	Event count attribute
ER	Error rate attribute	Not an error rate attribute	Error rate attribute
PE	Performance attribute	Not a performance attribute	Performance attribute
OC	Online collection attribute	Collected only during offline activity	Collected during both offline and online activity
PW	Pre-fail warranty attribute	Advisory	Pre-fail

5.4.1.1 Timed Workload Endurance Indicators

Timed Workload Media Wear Indicator — ID E2h

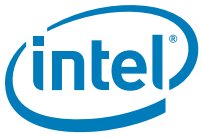
This attribute tracks the drive wear seen by the device during the last wear timer loop, as a percentage of the maximum rated cycles. The raw value tracks the percentage up to 3 decimal points. This value should be divided by 1024 to get the percentage. For example: if the raw value is 4450, the percentage is 4450/1024 = 4.345%. The raw value is held at FFFFh until the wear timer (attribute E4h) reaches 60 (minutes). The normalized value is always set to 100 and should be ignored.

Timed Workload Host Reads Percentage — ID E3h

This attribute shows the percentage of I/O operations that are read operations during the last workload timer loop. The raw value tracks this percentage and is held at FFFFh until the workload timer (attribute E4h) reaches 60 (minutes). The normalized value is always set to 100 and should be ignored.

Workload Timer — ID E4h

This attribute is used to measure the time elapsed during the current workload. The attribute is reset when a SMART EXECUTE OFFLINE IMMEDIATE (D4h) subcommand 40h is issued to the drive. The raw value tracks the time in minutes and has a maximum value of 232 = 4,294,967,296 minutes (8,171 years). The normalized value is always set to 100 and should be ignored.



Example Use Cases

The Timed Workload Endurance attributes described in this section are intended to be used to measure the amount of media wear that the drive is subjected to during a timed workload.

Ideally, the system that the drive is being used in should be capable of issuing SMART commands. Otherwise, provisions have been provided to allow the media wear attributes to be persistent so the drive can be moved to a SMART-capable system to read out the drive wear attribute values.

Use Case 1 – With a System Capable of SMART Commands

1. Make sure DIPM (Device Initiated Power Management) is disabled to ensure data collected is accurate.
2. Issue the SMART EXECUTE OFF-LINE IMMEDIATE (D4h) sub-command 40h to reset the drive wear attributes.
3. Run the workload to be evaluated for at least 60 minutes. Otherwise the drive wear attributes will not be available.
4. Read out the drive wear attributes with the SMART READ DATA (D0h) command.

Use Case 2 – With a System Not Capable of SMART Commands

1. Make sure DIPM is disabled to ensure data collected is accurate.
2. On a SMART capable system, issue the SMART EXECUTE OFF-LINE IMMEDIATE (D4h) sub-command 40h to reset the E4h (workload timer) attribute.
3. Move the drive to the system where the workload will be measured (and not capable of SMART commands).
4. Run the workload to be evaluated for at least 60 minutes. Otherwise the drive wear attributes will not be available.
5. Do a clean system power down by issuing the ATA STANDBY IMMEDIATE command prior to shutting down the system. This will store all the drive wear SMART attributes to persistent memory within the drive.
6. Move the drive to a SMART capable system.
7. Read out the drive wear attributes with the SMART READ DATA (D0h) command within 60 minutes after power-up.

Example Calculation of Drive Wear

The following is an example of how the drive wear attributes can be used to evaluate the impact of a given workload. The Host Writes SMART attribute (E1h) can also be used to calculate the amount of data written by the host during the workload by reading this attribute before and after running the workload. This example assumes that the steps shown in "Example Use Cases" on page 17 were followed to obtain the following attribute values:

- Timed Workload Media Wear (E2h) has a raw value of 16. Therefore, the percentage wear = 16/1024 = 0.016%.
- Timed Workload Host Read/Write Ratio (E3h) has a normalized value of 80, indicating that 80% of operations were reads.
- Workload Timer (E4h) has a raw value of 500. Therefore the workload ran for 500 minutes.

- Host Writes Count (E1h) had a raw value of 100,000 prior to running the workload and a value of 130,000 at the end of the workload. Therefore, the number of sectors written by the host during the workload was 30,000 * 65,535 = 1,966,050,000 sectors or 1,966,050,000 * 512/1,000,000,000 = 1,007 GB.

The following conclusions can be made for this example case:

The workload took 500 minutes to complete with 80% reads and 20% writes. A total of 1,007 GB of data was written to the device, which increased the media wear in the drive by 0.016%. At this point in time, this workload is causing a wear rate of 0.016% for every 500 minutes, or 0.00192%/hour.

5.4.2 SMART Logs

The Intel SSD 711 Series implements the following Log Addresses: 00h, 02h, 03h, 06h, and 07h.

The Intel SSD 711 Series implements host vendor specific logs (addresses 80h-9Fh) as read and write scratchpads, where the default value is zero (0). Intel® Solid-State Drive 711 Series does not write any specific values to these logs unless directed by the host through the appropriate commands.

The Intel SSD 711 Series also implements a device vendor specific log at address A9h as a read-only log area with a default value of zero (0).

Note: Log page 10h is not a S.M.A.R.T. log; however, the 10h log page supports Native Command Queuing as defined in the SATA Rev 2.6 specification.

5.5 Data Set Management Command Set

The Intel SSD 711 Series supports the Data Set Management command set Trim attribute, which consists of:

• DATA SET MANAGEMENT

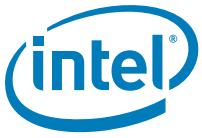
5.6 Host Protected Area Command Set

The Intel SSD 711 Series supports the Host Protected Area command set, which consists of:

- READ NATIVE MAX ADDRESS
- SET MAX ADDRESS
- READ NATIVE MAX ADDRESS EXT
- SET MAX ADDRESS EXT

The Intel SSD 711 Series also supports the following optional commands:

- SET MAX SET PASSWORD
- SET MAX LOCK
- SET MAX FREEZE LOCK
- SET MAX UNLOCK



5.7 48-Bit Address Command Set

The Intel SSD 711 Series supports the 48-bit Address command set, which consists of:

- FLUSH CACHE EXT
- READ DMA EXT
- READ NATIVE MAX ADDRESS
- READ NATIVE MAX ADDRESS EXT
- READ SECTOR(S) EXT
- READ VERIFY SECTOR(S) EXT
- SET MAX ADDRESS EXT
- WRITE DMA EXT
- WRITE MULTIPLE EXT
- WRITE SECTOR(S) EXT

5.8 Device Configuration Overlay Command Set

The Intel SSD 711 Series supports the Device Configuration Overlay command set, which consists of:

- DEVICE CONFIGURATION FREEZE LOCK
- DEVICE CONFIGURATION IDENTITY
- DEVICE CONFIGURATION RESTORE
- DEVICE CONFIGURATION SET

5.9 General Purpose Log Command Set

The Intel SSD 711 Series supports the General Purpose Log command set, which consists of:

- READ LOG EXT
- WRITE LOG EXT

5.10 Native Command Queuing

The Intel SSD 711 Series supports the Native Command Queuing (NCQ) command set, which includes:

- READ FPDMA QUEUED
- WRITE FPDMA QUEUED

Note: With a maximum Queue Depth set to 32.

5.11 Software Settings Preservation

The Intel SSD 711 Series supports the SET FEATURES parameter to enable/disable the preservation of software settings.

5.12 Device Initiated Power Management (DIPM)

The Intel SSD 711 Series supports the SET FEATURES parameter to enable Device Initiated Power Management.

6.0 Certifications and Declarations

Table 13 describes the Device Certifications supported by the Intel SSD 711 Series.

Table 13. Device Certifications and Declarations

Certification	Description
CE Compliant	Indicates conformity with the essential health and safety requirements described in European Directives Low Voltage Directive and EMC Directive.
UL Certified	Underwriters Laboratories, Inc. Component Recognition UL60950-1.
C-Tick Compliant	Compliance with the Australia/New Zealand Standard AS/NZS3548 and Electromagnetic Compatibility (EMC) Framework requirements of the Australian Communication Authority (ACA).
BSMI Compliant	Compliance to the Taiwan EMC standard “Limits and methods of measurement of radio disturbance characteristics of information technology equipment, CNS 13438 Class B.”
KCC	Compliance with paragraph 1 of Article 11 of the Electromagnetic Compatibility Control Regulation and meets the Electromagnetic Compatibility (EMC) Framework requirements of the Radio Research Laboratory (RRL) Ministry of Information and Communication Republic of Korea.
Microsoft WHQL	Microsoft Windows Hardware Quality Labs
RoHS Compliant	Restriction of Hazardous Substance Directive
VCCI	Voluntary Control Council for Interface to cope with disturbance problems caused by personal computers or facsimile.
SATA-IO	Indicates certified logo program from Serial ATA International Organization.

7.0 References

Table 14 identifies the standards information referenced in this document.

Table 14. Standards References

Date or Rev. #	Title	Location
Sept 2010	Solid-State Drive (SSD) Requirements and Endurance Test Method (JESD218)	http://www.jedec.org/standards-documents/docs/jesd218/
Dec 2008	VCCI	http://www.vcci.jp/vcci_e/
June 2009	RoHS	http://qdms.intel.com/ Click MDDS Database and search for material description datasheet
August 2009	ATA/ATAPI-7	http://www.t13.org/
June 2009	Serial ATA Revision 3.0	http://www.sata-io.org/
May 2006	SFF-8223, 2.5-inch Drive w/Serial Attachment Connector	http://www.sffcommittee.org/
May 2005	SFF-8201, 2.5-inch drive form factor	http://www.sffcommittee.org/
1995 1996 1995 1995 1997 1994	International Electrotechnical Commission EN 61000 4-2 (Electrostatic discharge immunity test) 4-3 (Radiated, radio-frequency, electromagnetic field immunity test) 4-4 (Electrical fast transient/burst immunity test) 4-5 (Surge immunity test) 4-6 (Immunity to conducted disturbances, induced by radio-frequency fields) 4-11 (Voltage Variations, voltage dips, short interruptions and voltage variations immunity tests)	http://www.iec.ch/
1995	ENV 50204 (Radiated electromagnetic field from digital radio telephones)	http://www.dbicorporation.com/radimmun.htm

8.0 Terms and Acronyms

Table 15 defines the terms and acronyms used in this document.

Table 15. Glossary of Terms and Acronyms

Term	Definition
ATA	Advanced Technology Attachment
DAS	Device Activity Signal
DIPM	Device Initiated Power Management
DMA	Direct Memory Access
EXT	Extended
FPDMA	First Party Direct Memory Access
GB	Gigabyte Note: The total usable capacity of the SSD may be less than the total physical capacity because a small portion of the capacity is used for NAND flash management and maintenance purposes.
HDD	Hard Disk Drive
I/O	Input/Output
IOPS	Input/Output Operations Per Second
ISO	International Standards Organization
KB	Kilobyte (1,024 bytes)
LBA	Logical Block Address
MB	Megabyte (1,000,000 bytes)
MTBF	Mean Time Between Failures
NCQ	Native Command Queuing
NOP	No Operation
PB	Petabyte
PIO	Programmed Input/Output
RDT	Reliability Demonstration Test
RMS	Root Mean Squared
SATA	Serial Advanced Technology Attachment
SLC	Single-level Cell
SMART	Self-Monitoring, Analysis and Reporting Technology An open standard for developing hard drives and software systems that automatically monitors the health of a drive and reports potential problems.
SSD	Solid-State Drive
TYP	Typical
UBER	Uncorrectable Bit Error Rate

9.0 Revision History

Date	Revision	Description
October 2011	001	Initial release.

Appendix A IDENTIFY DEVICE Command Data

Table 16 details the sector data returned after issuing an IDENTIFY DEVICE command.

Table 16. Returned Sector Data

Word	F = Fixed V = Variable X = Both	Default Value	Description
0	F	0040h	General configuration bit-significant information
1	X	3FFFh	Obsolete - Number of logical cylinders (16,383)
2	V	C837h	Specific configuration
3	X	0010h	Obsolete - Number of logical heads (16)
4-5	X	0h	Retired
6	X	003Fh	Obsolete - Number of logical sectors per logical track (63)
7-8	V	0h	Reserved for assignment by the CompactFlash Association
9	X	0h	Retired
10-19	F	Varies	Serial number (20 ASCII characters)
20-21	X	0h	Retired
22	X	0h	Obsolete
23-26	F	Varies	Firmware revision (8 ASCII characters)
27-46	F	Varies	Model number (Intel Solid-State Drive)
47	F	8010h	7:0—Maximum number of sectors transferred per interrupt on MULTIPLE commands
48	F	0h	Reserved
49	F	2F00h	Capabilities
50	F	4000h	Capabilities
51-52	X	0h	Obsolete
53	F	0007h	Words 88 and 70:64 Valid
54	X	3FFFh	Obsolete - Number of logical cylinders (16,383)
55	X	0010h	Obsolete - Number of logical heads (16)
56	X	003Fh	Obsolete - Number of logical sectors per logical track (63)
57-58	X	00FBFC10h	Obsolete
59	F	0110h	Number of sectors transferred per interrupt on MULTIPLE commands
60-61	F	2EB0 03BAh (32 GB)	Total number of user addressable sectors
		0AB0 0774h (64 GB)	
62	X	0h	Obsolete
63	F	0007h	Multi-word DMA modes supported/selected
64	F	0003h	PIO modes supported
65	F	0078h	Minimum Multiword DMA transfer cycle time per word
66	F	0078h	Manufacturer's recommended Multiword DMA transfer cycle time
67	F	0078h	Minimum PIO transfer cycle time without flow control

Table 16. Returned Sector Data (Continued)

Word	F = Fixed V = Variable X = Both	Default Value	Description
68	F	0078h	Minimum PIO transfer cycle time with IORDY flow control
69-70	F	0h	Reserved (for future command overlap and queuing)
71-74	F	0h	Reserved for the IDENTIFY PACKET DEVICE command.
75	F	001Fh	Queue depth
76	F	0506h	Serial ATA capabilities
77	F	0h	Reserved for future Serial ATA definition
78	F	0048h	Serial ATA features supported
79	V	0040h	Serial ATA features enabled
80	F	00FCh	Major Version Number
81	F	001Ah	Minor Version Number
82	F	746Bh	Command set supported.
83	F	7D01h	Command sets supported.
84	F	6163h	Command set/feature supported extension.
85	V	7469h	Command set/feature enabled.
86	V	BD01h	Command set/feature enabled.
87	V	6163h	Command set/feature default.
88	V	407Fh	Ultra DMA Modes
89	F	0001h	Time required for security erase unit completion
90	F	0001h	Time required for Enhanced security erase completion
91	V	0h	Current advanced power management value
92	V	FFFEh	Master Password Revision Code
93	F	0h	Hardware reset result. The contents of bits (12:0) of this word shall change only during the execution of a hardware reset.
94	V	0h	Vendor's recommended and actual acoustic management value.
95	F	0h	Stream Minimum Request Size
96	V	0h	Streaming Transfer Time - DMA
97	V	0h	Streaming Access Latency - DMA and PIO
98-99	F	0h	Streaming Performance Granularity
100-103	V	2EB0 03BA 0000 0000h (32 GB) 0AB0 0774 0000 0000h (64 GB)	Maximum user LBA for 48-bit Address feature set.
104	V	0h	Streaming Transfer Time - PIO
105	F	0h	Reserved
106	F	4000h	Physical sector size / logical sector size
107	F	0h	Inter-seek delay for ISO-7779 acoustic testing in microseconds
108-111	F	Varies	Unique ID
112-115	F	0h	Reserved for world wide name extension to 128 bits
116	V	0h	Reserved for technical report-

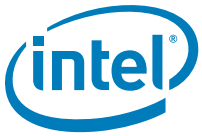


Table 16. Returned Sector Data (Continued)

Word	F = Fixed V = Variable X = Both	Default Value	Description
117-118	F	0h	Words per Logical Sector
119	F	401Ch	Supported Settings
120	F	401Ch	Command Set/Feature Enabled/Supported
121-126	F	0h	Reserved
127	F	0h	Removable Media Status Notification feature set support
128	V	0021h	Security status
129-159	X	0h	Vendor specific
160	F	0h	CompactFlash Association (CFA) power mode 1
161-175	X	0h	Reserved for assignment by the CFA
176-205	V	0h	Current media serial number
206-216	F	0h	Reserved
217	F	0001h	Non-rotating media device
218-221	F	0h	Reserved
222	F	101F	Reserved
223-233	F	0h	Reserved
234		0001h	Reserved
235		01F0h	Reserved
236-254	F	0h	Reserved
255	X	Varies	Integrity word (Checksum and Signature)

Notes: **F = Fixed**. The content of the word is fixed and does not change. For removable media devices, these values may change when media is removed or changed.
V = Variable. The state of at least one bit in a word is variable and may change depending on the state of the device or the commands executed by the device.
X = F or V. The content of the word may be fixed or variable.