Intel® Solid-State Drive 910 Series

Product Specification

- Capacity: 400/800 GB
- Components:
  — Intel® 25nm NAND Flash Memory
  — High Endurance Technology (HET) Multi-Level Cell (MLC)
- Form Factor: PCI Express* x8 add-in card (half-height, half-length)
- Device-based NAND Management
- Read and Write IOPS[1,2] (Full LBA Range, Iometer* Queue Depth 32 per NAND module)
  Default/Max Performance[3] mode:
  — Random 4 KB reads: Up to 180,000 IOPS
  — Random 4 KB writes: Up to 75,000 IOPS
- Bandwidth Performance[1,2]
  Default mode:
  — Sustained sequential read: Up to 2 GB/s
  — Sustained sequential write: Up to 1 GB/s
  Max Performance mode[3]:
  — Sustained sequential read: Up to 2 GB/s
  — Sustained sequential write: Up to 1.5 GB/s
- Latency (average sequential application level)
  — Read: < 65 μs (TYP)
  — Write: < 65 μs (TYP)
- Temperature monitoring and logging
- SCSI Command Set support
- SCSI Mode Page Support
- Compliant with PCI Express 2.0
- Compatibility:
  — Windows Server* 2008 R2 SP1/SP2
  — Windows Server* 2003 R2 SP2
  — Windows* 7
  — Red Hat* Enterprise Linux* 5.5, 5.6, 6.1, 6.2[4]
  — VMware* ESXi 5.0/5.1
  — SUSE* Linux Enterprise Server 11 SP1[5]

- Power Management
  — 3.3 V and 12 V Supply Rail
- Enhanced Power-Loss Data Protection
- Power
  — Active: Up to 25 W
  — Idle: 8 W (TYP)
- Weight:
  — 400 GB: 125 g
  — 800 GB: 190 g
- Temperature
  — Operating (Default mode): 0° C to 55° C with minimum 200 LFM airflow
  — Operating (Max Performance mode): 0° C to 55° C with minimum 300 LFM airflow
  — Non-Operating: -55° C to +95° C[6]
- Shock: 50G (trapezoidal), velocity change 170 in/s
- Vibration: 3.13 G_{RMS} (5-500Hz)
- Reliability
  — Unrecoverable Bit Error Rate (UBER): 1 sector per 10^{16} bits read
- MTBF: 1,000,000 hours
- Lifetime Endurance (8 KB):
  — 400 GB: Up to 7 PB
  — 800 GB: Up to 14 PB
- Certifications and Declarations:
  — UL*
  — CE*
  — BSMI*
  — KCC*
  — C-Tick*
  — VCCI*
  — WEEE*
- Product Ecological Compliance: RoHS*

1. Performance values vary by capacity. See "Performance" on page 7 for details.
2. Performance specifications apply to both compressible and incompressible data.
3. Max Performance mode requires higher power and airflow. See "Electrical Characteristics" and "Environmental Conditions" on page 8 for details.
4. RHEL 5.5 (kernel 2.6.18-194); 5.6 (kernel 2.6.18-238); 6.1 (kernel 2.6.32-131); 6.2 (kernel 2.6.32-220)
5. SLES 11 SP1 (kernel 2.6.32)
6. Please contact your Intel representative for details on the non-operating temperature range.

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 910 Series (Intel® SSD 910 Series).

The Intel® SSD 910 Series delivers leading performance for PCI-Express* (PCIe*)-based storage solutions in two capacities: 400 GB and 800 GB.

By combining Intel® 25nm NAND Flash Memory with High Endurance Technology (HET), a NAND management scheme through controller and firmware optimization, and an industry leading PCIe-SAS controller, the Intel® SSD 910 Series delivers sequential speeds up to 2 GB/s and 1 GB/s (read/write) and random speeds up to 180,000 IOPS and 75,000 IOPS (read/write). On systems that can support higher power, the Intel® SSD 910 series can be configured to work in a high-performance mode to deliver sequential write bandwidth up to 1.5 GB/s. The extreme performance of the Intel® SSD 910 Series is independent of workload type, and remains the same with both compressible and incompressible data.

Additionally, the Intel® SSD 910 Series is capable of random write endurance up to 14 PB on 8 KB transfer size. HET is the application of higher endurance Intel NAND with wear reduction techniques. HET NAND contains design test enhancements beyond Intel compute-quality NAND. Wear reduction techniques designed into the controller and firmware further enhance drive endurance. The combination of both technologies provides up to 30X endurance increase over Intel SSDs utilizing compute quality NAND with standard controller and firmware drive management technology.

The industry standard PCIe form factor enables the Intel® SSD 910 Series to be used in high-performance storage applications where there is need for high responsiveness and sustained throughput. Being a device-managed SSD, the Intel® SSD 910 Series delivers high performance without taxing the host system's CPU or memory resources.

In addition to performance, the Intel® SSD 910 Series provides the following data integrity and reliability features:

- Enhanced power loss data protection
- Data path error protection
- Redundant array of surplus NAND for parity protection
- Self diagnostics at power-on
- Thermal sensors

1.1 Architecture

The 400 GB and 800 GB SSDs have two and four NAND modules, respectively. Each NAND module contains 200 GB of NAND flash memory capacity with its own NAND ASIC with SAS interface support of up to 6 Gb/s.

On the host side, the Intel® SSD 910 Series supports PCIe 2.0 bus speed. An on-chip PCIe-to-SAS bridge chip supports this translation.

Figure 1 shows the architecture of the 800 GB Intel SSD 910 Series.

Figure 1.   Intel® SSD 910 Series (800 GB) Architecture
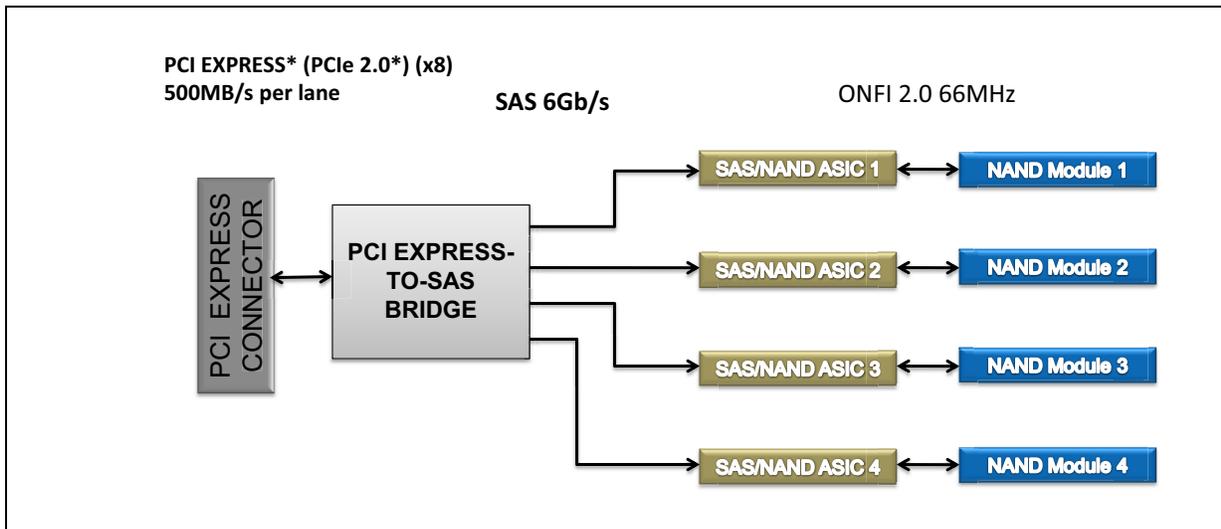
2.0 Product Specifications

2.1 Capacity

Table 1.   User Addressable Sectors

Intel® SSD 910 Series	Unformatted Capacity (Total User Addressable Sectors in LBA Mode)
400 GB	781,425,936 (390,721,968 per NAND module)
800 GB	1,562,851,872 (390,721,968 per NAND module)

Note: 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. Total capacity represents aggregate of capacity over 4/2 NAND modules. LBA count on each NAND module follows IDEMA standards.

2.2 Performance

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

Specification[1]	Unit	400 GB	800 GB (Default)	800 GB (Max Performance[2])
Random 4 KB Read (up to)	IOPS	90,000	180,000	180,000
Random 4 KB Write (up to)	IOPS	38,000	75,000	75,000

Notes:
1. Performance measured using Iometer* with Queue Depth 32 per NAND module. Measurements performed on full LBA span of the drive. Random workload run on 4/2 NAND modules (800 GB/400 GB) simultaneously. Performance measured is aggregate across all NAND modules. Performance specifications apply to both compressible and incompressible data.
2. Requires higher power and airflow.

Table 3.   Maximum Sustained Sequential Read and Write Bandwidth

Specification[1]	Unit	400 GB	800 GB (Default)	800 GB (Max Performance[2])
Sequential Read (up to)	MB/s	1000	2,000	2,000
Sequential Write (up to)	MB/s	750	1,000	1,500

Notes:
1. Performance measured using Iometer with 128 KB (131,072 bytes) of transfer size with Queue Depth 32 per NAND module. Workload run on 4/2 NAND modules (800 GB/400 GB) simultaneously. Performance measured is aggregate across all NAND modules. Performance specifications apply to both compressible and incompressible data.
2. Requires higher power and airflow.

Table 4.   Latency

Specification	400 GB	800 GB

Latency[1]
    Read[2]
    Write[3]
	< 65 μs (TYP)
	< 65 μs (TYP)	

Notes:
1.   Values represent application-level round-trip latency.
2.   Device measured using Iometer. Latency measured using sequential 512 B transfer size with Queue Depth 1, and measured on a per-NAND module basis.
3.   Device measured using Iometer. Latency measured using sequential 4 KB transfer size with Queue Depth 1, and measured on a per-NAND module basis.

2.3 Electrical Characteristics

Table 5. **Operating Voltage and Power Consumption**

Electrical Characteristics	Value

Operating Voltage for 3.3 V (± 9%)
    Min
    Max
	
	3.00 V
	3.60 V

Operating Voltage for 12 V (± 8%)
    Min
    Max
	
	11.04 V
	12.96 V

Power Consumption
    Active[1] (Default Mode)
    Active[1] (Max Performance Mode)
    Idle (Typical)
	
	< 24 W (Typical), < 30 W (Peak)
	< 28 W (Typical), < 38 W (Peak)
	8 W (400 GB), 12 W (800 GB)

Inrush Current (Typical peak)	800GB: 1.1 A 400GB: 0.6 A

Note: 1. Measurement window = 100 ms

2.4 Environmental Conditions

Table 6. **Temperature, Shock, Vibration**

Temperature	Range

Ambient Temperature
    Operating (default)
    Operating (Max Performance mode)
    Non-operating
	
	0 to 55º C[1]
	0 to 55º C[2]
	-55º C to +95º C[3]

Shock and Vibration	**Range**
Shock	50G (trapezoidal), velocity change 170 in/s
Vibration	3.13 G_{RMS} (5-500Hz)

Notes: 1. With minimum 200 Linear Feet per Minute (LFM) airflow.
2. With minimum 300 Linear Feet per Minute (LFM) airflow.
3. Please contact your Intel representative for details on the non-operating temperature range.

2.5 Product Regulatory Compliance

The Intel® SSD 910 Series meets or exceeds the regulatory or certification requirements in Table 7.

Table 7. **Product Regulatory Compliance Standards**

Title	Description	Region For Which Conformity Declared
TITLE 47-Telecommunication CHAPTER I— FEDERAL COMMUNICATIONS COMMISSION PART 15 — RADIO FREQUENCY DEVICES	FCC Part 15B Class A	USA
ICES-003, Issue 4 Interference-Causing Equipment Standard Digital Apparatus	CAN/CSA-CEI/IEC CISPR 22:02. This is CISPR 22:2008 with Canadian modifications.	Canada

Table 7.   Product Regulatory Compliance Standards (Continued)

Title	Description	Region For Which Conformity Declared
IEC 555024 Information Technology Equipment — Immunity characteristics — Limits and methods of measurement CISPR 24:2010	EN-55024: 2010 and its amendments	European Union
EN-55022 Information technology equipment — Radio disturbance characteristics — Limits and methods of measurement CISPR 22:2008 (Modified)	EN-55022: 2010 and its amendments	European Union
EN-60950-1 2nd Edition	Information Technology Equipment — Safety — Part 1: General Requirements	USA/Canada
UL/CSA 60950-1 2nd Edition	Information Technology Equipment — Safety — Part 1: General Requirements	USA/Canada

2.6   Reliability

Reliability specifications are listed 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 per 10^{16} bits read, max
Lifetime Endurance The SSD will be able to write host data equal to the lifetime endurance specification.	See Section 2.7, "Write Endurance"
MTBF Mean Time Between Failure is estimated based on Telcordia* methodology and demonstrated through Reliability Demonstration Test (RDT).	1,000,000 hours

2.7   Write Endurance

Write endurance is measured while running 100% random 4 KB and 8 KB writes spanning 100% of the SSD using Iometer.

Table 9.   Write Endurance Specifications

Intel SSD 910 Series	4 KB Writes	8 KB Writes
400 GB	Up to 5 PB (2.5 PB per NAND module)	Up to 7 PB (3.5 PB per NAND module)
800 GB	Up to 10 PB (2.5 PB per NAND module)	Up to 14 PB (3.5 PB per NAND module)

Note: Assumes wear-leveling over all NAND modules. The 400 GB SSD presents storage as two 200 GB NAND modules. The 800 GB SSD presents storage as four 200 GB NAND modules. Each NAND volume will deliver specified 'per NAND module' endurance independent of other NAND modules. Total drive endurance is a sum of endurances of each NAND module.

3.0   Mechanical Information

Figure 2 shows the physical package information for the 400 GB Intel® SSD 910 Series. All dimensions are in millimeters.

Figure 2.   400 GB Intel® SSD 910 Series Dimensions
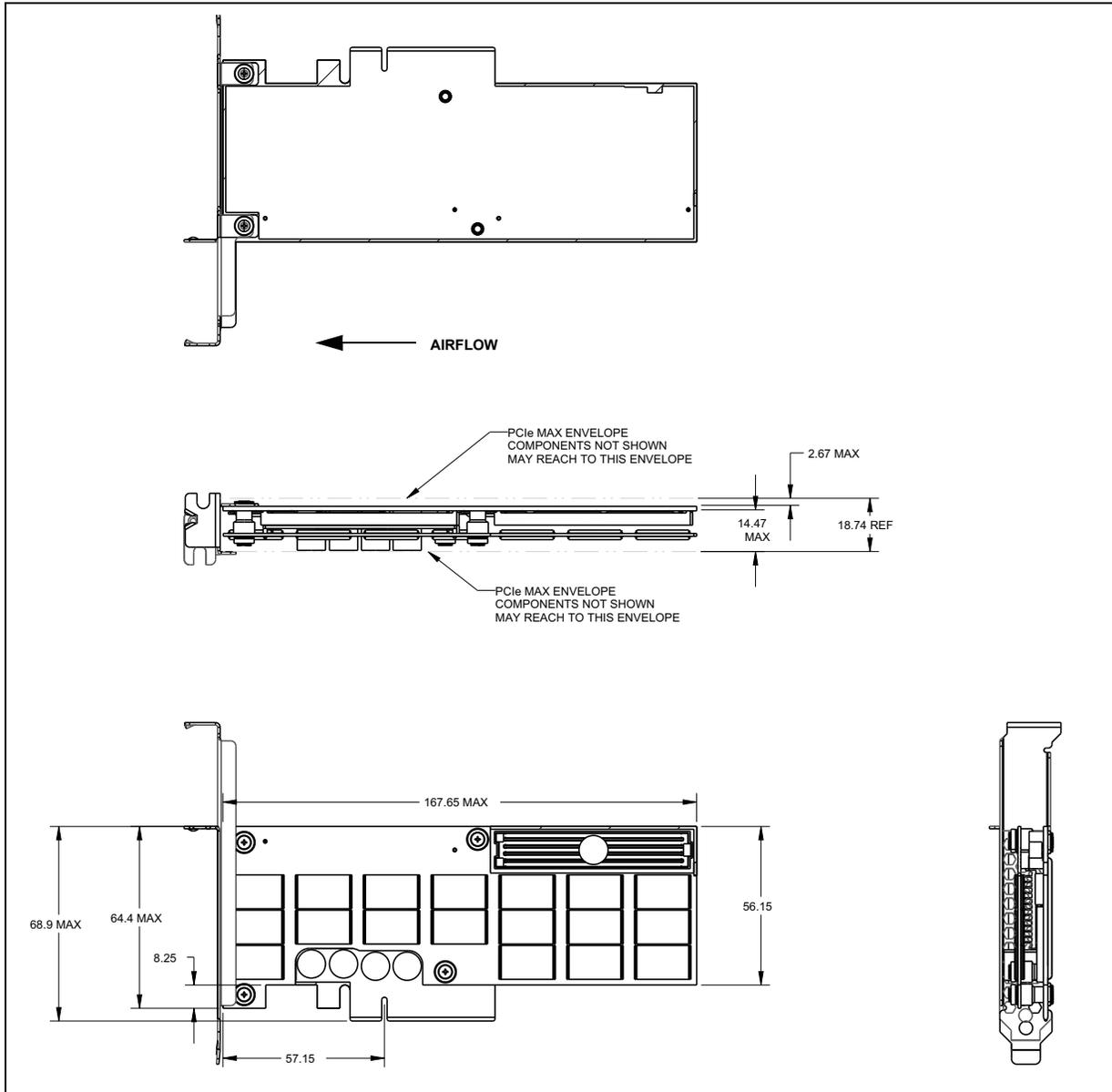
Figure 3 shows the physical package information for the 800 GB Intel® SSD 910 Series. All dimensions are in millimeters.

Figure 3.   800 GB Intel® SSD 910 Series Dimensions
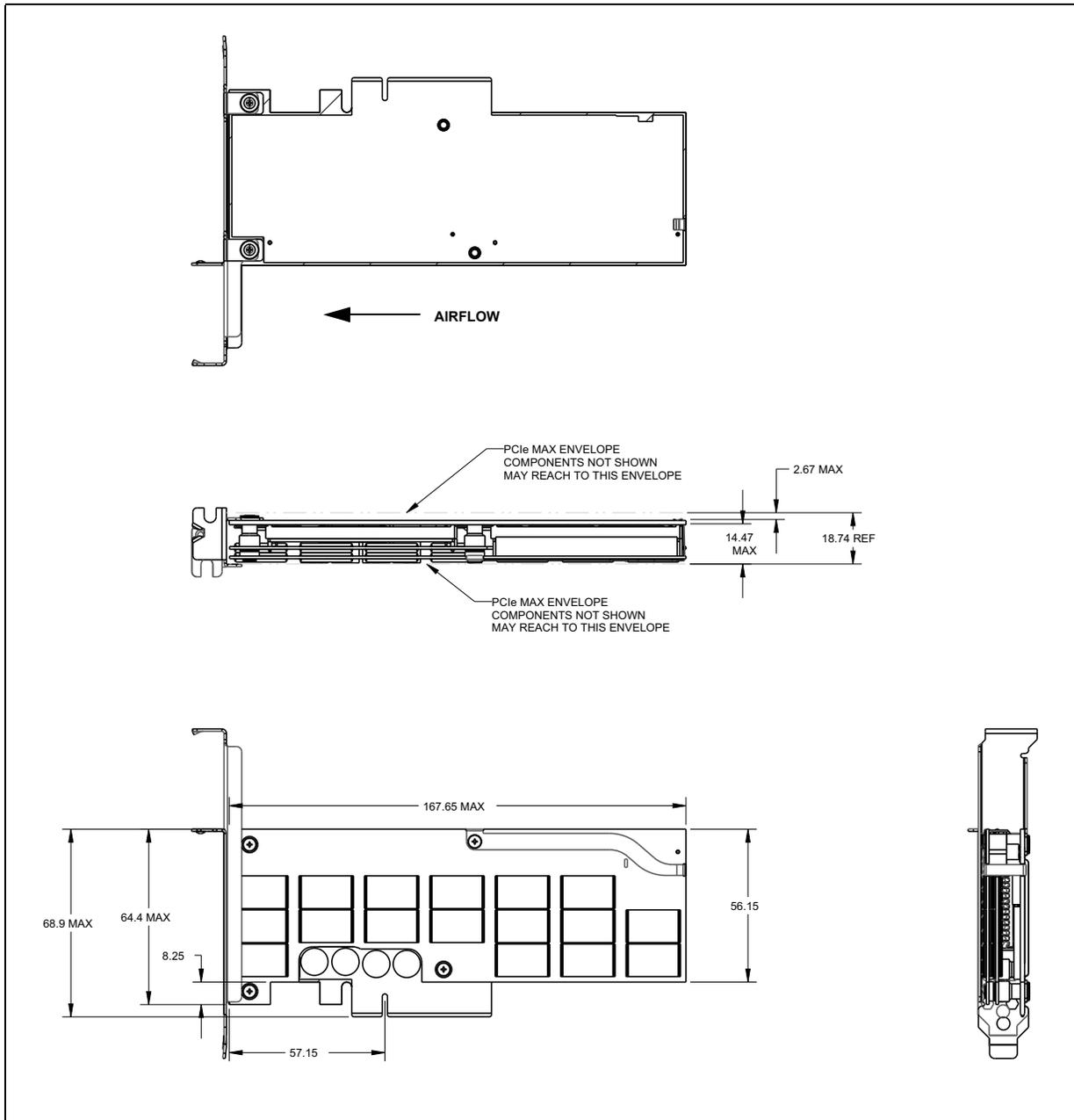
4.0 Supported SCSI Commands and Pages

The Intel® SSD 910 Series supports the SCSI commands and pages defined in this section.

4.1 SCSI Commands

Table 10. Supported SCSI Commands

Type	Code	Description
M	04h	FORMAT UNIT (04)
M	12h	INQUIRY (12)
O	4Ch	LOG SELECT (4C)
O	4Dh	LOG SENSE (4D)
O	15h	MODE SELECT (15)
O	55h	MODE SELECT (55)
O	1Ah	MODE SENSE (1A)
O	5Ah	MODE SENSE (5A)
O	5Eh	PERSISTENT RESERVE IN (5E)
O	5Fh	PERSISTENT RESERVE OUT (5F)
O	34h	PRE-FETCH (34)
M	08h	READ (6) - (08)
M	28h	READ (10) - (28)
O	A8h	READ (12) - (A8)
O	88h	READ (16) - (88)
O	7Fh/09h	READ (32) - (7F/09)
O	3Ch	READ BUFFER (3C)
M	25h	READ CAPACITY (10) - (25)
O	9Eh/10h	READ CAPACITY (16) (9E/10)
O	37h	READ DEFECT DATA (37)
O	B7h	READ DEFECT DATA (B7)
O	3Eh	READ LONG (3E)
O	07h	REASSIGN BLOCKS (07)
O	1Ch	RECEIVE DIAGNOSTICS RESULTS (1C)
M	17h	RELEASE (17)
O	57h	RELEASE (57)
O	A3h/05h	REPORT DEVICE IDENTIFIER (A3/05)
O	A0h	REPORT LUNS (A0)
O	A3h/0Ch	REPORT SUPPORTED OPERATION CODES (A3/0C)
O	A3h/0Dh	REPORT SUPPORTED TASK MANAGEMENT FUNCTIONS (A3/0D)
M	03h	REQUEST SENSE (03)
M	16h	RESERVE (16)

Table 10. Supported SCSI Commands (Continued)

Type	Code	Description
O	56h	RESERVE (56)
O	01h	REZERO UNIT (01)
M	1Dh	SEND DIAGNOSTIC (1D)
O	A4h/06h	SET DEVICE IDENTIFIER (A4/06)
O	1Bh	START STOP UNIT (1B)
O	35h	SYNCHRONIZE CACHE (10) - (35)
O	91h	SYNCHRONIZE CACHE (16) - (91)
M	00h	TEST UNIT READY (00)
O	2Fh	VERIFY (2F)
O	AFh	VERIFY (12) - (AF)
O	AFh	VERIFY (16) - (8F)
O	7Fh/0Ah	VERIFY (32) - (7F/0A)
M	0Ah	WRITE (6) - (0A)
M	2Ah	WRITE (10) - (2A)
O	AAh	WRITE (12) - (AA)
O	8Ah	WRITE (16) - (8A)
O	7Fh/0Bh	WRITE (32) - (7F/0B)
O	2Eh	WRITE AND VERIFY (10) - (2E)
O	AEh	WRITE AND VERIFY (12) - (AE)
O	8Eh	WRITE AND VERIFY (16) - (8E)
O	7Fh/0Ch	WRITE AND VERIFY (32) - (7F/0C)
O	3Bh	WRITE BUFFER (3B)
O	3Fh	WRITE LONG (3F)
O	41h	WRITE SAME (41)
O	93h	WRITE SAME (16) - (93)
O	7Fh/0Dh	WRITE SAME (32) - (7F/0D)

Notes: M = Mandatory
 O = Optional

4.2 SCSI Mode Page

Table 11. Supported SCSI Mode Pages

Mode Page	Notes
Page 01h – Read/Write Error Recovery	AWRE (Automatic Write Reallocation) ignored (reallocation always performed)
	ARRE (Automatic Read Reallocation Enabled) ignored (reallocation always performed)
	TB (Transfer Block) ignored
	RC (Read Continuous) ignored
	EER (Enable Early Recovery) ignored
	PER (Post Error) supported
	DTE (Data Terminate on Error) ignored
	DCR (Disable Correction) ignored
	Read Retry Count ignored
	Write Retry Count ignored
	Recovery Time Limit ignored
Page 02h – Disconnect/Reconnect	Read Buffer Full Ratio ignored
	Bus Inactivity Time Limit supported
	Disconnect Time Limit not supported
	Write Buffer Empty Ratio ignored
	Maximum Connect Time Limit supported
	Max burst size supported
Page 03h – Format Device	Page contains no changeable parameters
Page 04h – Rigid Disk Drive Geometry	Page contains no changeable parameters
Page 07h – Verify Error Recovery	Verify supported
	EER (Enable Early Recovery) ignored
	PER (Post Error) ignored
	DTE (Data Terminate on Error) ignored
	DCR (Disable Correction) ignored
	Verify Recovery Time Limit ignored

Table 11.   Supported SCSI Mode Pages (Continued)

Mode Page	Notes
Page 08h – Caching	IC (Initiator Control) ignored
	ABPF (Abort Pre-fetch) ignored
	CAP (Caching Analysis Permitted) ignored
	DISC (Discontinuity) ignored
	Size Enable ignored
	WCE (Write Cache Enable) ignored
	MF (Multiplication Factor) ignored
	RCD (Read Cache Disable) ignored
	Demand Read Retention Priority ignored
	Write Retention Priority ignored
	Disable Pre-fetch Transfer length ignored
	Min/Max Pre-fetch ignored
	Max Pre-fetch Ceiling ignored
	FSW (Force Sequential Write) ignored
	LBCSS (Logical Block Cache Segment Size) ignored
	DRA (Disable Read Ahead) unsupported
	Number of Cache Segments ignored
	Cache/Non Cache Segment Size ignored
Page 0Ah – Control Mode Page	Queue Algorithm Modifier supported
	QERR (Queue Error Management) supported
	Dque (Disable Queuing) ignored
	ATO (Application Tag Owner) supported
	Busy Timeout Period ignored
	Extended Self-Test Routine Completion Time supported
Page 0Ah Subpage 1 – Control Extension	Page contains no changeable parameters
Page 0Ch – Notch	Obsolete for SSDs
Page 18h – SAS Protocol Specific	Page contains no changeable parameters
Page 19h – Port Control Parameters	Supported. No SSD-unique changes
Page 19h Subpage 1 – SAS Phy	Supported. No SSD-unique changes
Page 19h Subpage 2 – Shared Port Control	Supported. No SSD-unique changes
Page 19h Subpage 3 – Phy Mode Page	Supported. No SSD-unique changes
Page 1Ah – Power Control	Page contains no changeable parameters (power save modes not supported)

Table 11.   Supported SCSI Mode Pages (Continued)

Mode Page	Notes
Page 1Ch – Informational Exceptions	PERF (Performance) ignored
	EBF (Enable Background Function) ignored
	EWASC (Enable Warning ASC) enable temperature warnings supported
	DEXCPT (Disable Exception Control) supported
	TEST supported
	EBACKERR (Enable Background Error) supported
	LOGERR (Log Errors) ignored
	Method of Reporting supported
	Interval Timer supported
	Report Count supported
Page 1Ch Subpage 1 – Background Control	Supported

4.3   Log Sense Pages

Table 12.   Supported SCSI Log Sense Pages

Page Code	Function
0h	Supported Log Pages
2h	Counters for Write Errors
3h	Counters for Read Errors
5h	Counters for verify errors
6h	Counters for non-medium errors
Dh	Temperature information
Eh	Manufacturing Date Information
Fh	Application Client Log
10h	Self-Test Results
11h	Solid State Media Log Page
15h	Background Medium Scan Operations

Table 12.   Supported SCSI Log Sense Pages (Continued)

Page Code	Function
18h	Protocol-specific log parameters: Attached Device Type Attached Reason Reason Negotiated PHY Link Rate The GENERATION CODE Attached Initiator Port Bits Attached Target Port SAS Address Attached SAS Address Attached PHY identifier INVALID DWORD COUNT Running Disparity Error Count Loss of DWORD Synchronization PHY RESET Problem
1Ah	Accumulated Transitions to Active State Accumulated Transitions to Idle_A Accumulated Transitions to Idle_B Accumulated Transitions to Idle_C Accumulated Transitions to Standby_Z Accumulated Transitions to Standby_Y
2Fh	Supported SMART Attributes For more details, see Table 13, "SMART Attributes".
30h	Fixed
37h	Miscellaneous data counters: Power On Hours (bytes 8-11) Total Bytes Read (bytes 12-19) Total Bytes Written (bytes 20-27) Max Drive Temp (byte 28) Number of Information Exceptions (byte 31) Total Read Commands (bytes 33-40) Total Write Commands (bytes 41-48) Flash Correction Count (bytes 50-51)

4.4   SMART Attributes

The Intel® SSD 910 Series supports the SMART attributes in Table 13, which are captured on log page 2Fh.

Table 13.   SMART Attributes

SMART Parameter Code	Attribute Name	Severity	Brief Description	Trip Condition/ Threshold	SMART Sense Code	SMART Sense Qualifier
000h	Temperature	Pre-failure	Temperature reading from sensor	Temperature of 85°C is reached	5Dh	10h
001h	Remaining Reserve 1	Pre-failure	Amount of Reserve (spare) blocks remaining; degradation	Performance degradation of up to 10%	5Dh	53h

Table 13.   SMART Attributes (Continued)

SMART Parameter Code	Attribute Name	Severity	Brief Description	Trip Condition/ Threshold	SMART Sense Code	SMART Sense Qualifier
002h	Remaining Reserve 2	Pre-failure	Amount of Reserve (spare) blocks remaining; severe degradation	99% of firmware defect limit is reached	5Dh	54h
003h	Volatile Memory Backup Failure	Pre-failure	Indication that the test of backup capacitors for power loss protection has failed	1 capacitor self test failure	5Dh	28h
004h	Wear Indicator	Warning	Maximum count of block erases on any band	100% of max spec cycles used	0Bh	03h

The SMART attributes are logged in page 2Fh in the format described in Table 14.

Table 14.   SMART Attribute Logging Format

BYTE	BIT							
	7	6	5	4	3	2	1	0
0-1	Parameter Code > 0000h							
2	DU=0	DS=0	TSD = 0	ETC = 0	TMC = 0		F&L = 11b	
3	Parameter Length = 04h							
4	SMART Parameter Sense Code							
5	SMART Parameter Sense Qualifier							
6	SMART Attribute Percentage of Threshold							
7	SMART Attribute Trip							

SMART PARAMETER SENSE CODE is the one-byte value indicating the severity of this particular parameter when host notification for SMART trip is made. For example, 0x5D indicates pre-fail attribute and 0x0B indicates warning attribute.

SMART PARAMETER SENSE QUALIFIER is the one-byte value that uniquely identifies each particular parameter when host notification for SMART trip is made.

SMART ATTRIBUTE PERCENTAGE OF THRESHOLD indicates an estimate of the percentage of threshold reached for the vendor unique SMART attributes. The value in the field is set to zero at the time of manufacture. A value of 64h indicates that the threshold has been reached and SMART trip will be reported to the host if enabled. The value is allowed to exceed 64h. Values greater than 254 are reported as 255. The device server shall update the value at least once per power-on hour. Note that the Volatile memory backup attribute is a pass/fail indicator so it will always read 0h unless the capacitor self test fails, and in that case it would report 64h.

SMART ATTRIBUTE TRIP is set to 1b if the threshold for that SMART attribute has ever been exceeded. It is set to 0b if the threshold has never been exceeded.

4.5 Inquiry Pages

Table 15. Supported SCSI Inquiry Pages

Page Code	Content
00h	Supported Page Codes
03h	Firmware information
80h	Serial number
83h	Device Identification
86h	Extended Inquiry data/ Protection information
87h	Mode Page Policy
88h	SCSI Protocol specific information
8Ah	Power Condition Page
90h	Protocol specific LUN descriptors
B0h	Device type specific information
B1h	Device type specific information
D2h	Vendor specific board information

5.0 Certifications and Declarations

Table 16 describes the device certifications and declarations supported by the Intel® SSD 910 Series.

Table 16. Device Certifications and Declarations

Certification	Description
CE Compliant	Low Voltage DIRECTIVE 2006/95/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 12 December 2006, and EMC Directive 2004/108/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 15 December 2004.
UL Recognized	Underwriters Laboratories, Inc. Bi-National Component Recognition; UL 60950-1, 2nd Edition, 2007-03-27 (Information Technology Equipment - Safety - Part 1: General Requirements) CSA C22.2 No. 60950-1-07, 2nd Edition, 2007-03 (Information Technology Equipment - Safety - Part 1: General Requirements)
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 CNS 13438: Information technology equipment - Radio disturbance Characteristics - limits and methods of measurement, as amended on June 1, 2006, is harmonized with CISPR 22: 2005.04.
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.
VCCI	Voluntary Control Council for Interface to cope with disturbance problems caused by personal computers or facsimile.
RoHS Compliant	Restriction of Hazardous Substance Directive
WEEE	Directive on Waste Electrical and Electronic Equipment

6.0 References

Table 17 identifies the standards information referenced in this document.

Table 17. 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/
January 2007	PCI Express Base Specification Revision 2.0	http://www.pcisig.com/members/downloads/specifications/pciexpress/PCI_Express_CEM_r2.0_cb.pdf

7.0 Terms and Acronyms

Table 18 defines the terms and acronyms used in this document.

Table 18. Glossary of Terms and Acronyms

Term	Definition
GB/s	Gigabytes/sec (10^{30} bytes/sec)
HET	High Endurance Technology
IOPS	Input/Output Operations Per Second
KB	Kilobyte (1,024 bytes)
LBA	Logical Block Address
LFM	Linear Feet per Minute
MB/s	Megabytes/sec (10^{20} bytes/sec)
MLC	Multi-Level Cell
MTBF	Mean Time Between Failures
PB	Petabyte (one quadrillion bytes or 1,000 terabytes)
PCI Express (PCIe)	Peripheral Component Interconnect Express
RDT	Reliability Demonstration Test
SAS	Serial Attached SCSI
SCSI	Small Computer System Interface
SSD	Solid-State Drive
TB	Terabyte (one trillion bytes)
TYP	Typical
UBER	Uncorrectable Bit Error Rate

8.0   Revision History

Date	Revision	Description
April 2012	001	Initial release.
June 2012	002	Production release. Updated MTBF and Mechanical Drawings. Added Max Performance mode and SMART details.
April 2013	003	Added Red Hat* Enterprise Linux version 6.2 to compatible OS list. Added kernel information for Red Hat* Enterprise Linux and SUSE* Linux Enterprise Server OS compatibility.
April 2013	004	Added VMware* ESXi 5.0/5.1 to compatible OS list.