intel®

Intel® Z-P230 PATA Solid State Drive

SSDPAMM0004G1, SSDPAMM0008G1, SSDPAMM0016G1, SSDPAEM0004G1, SSDPAEM0008G1, SSDPAEM0016G1
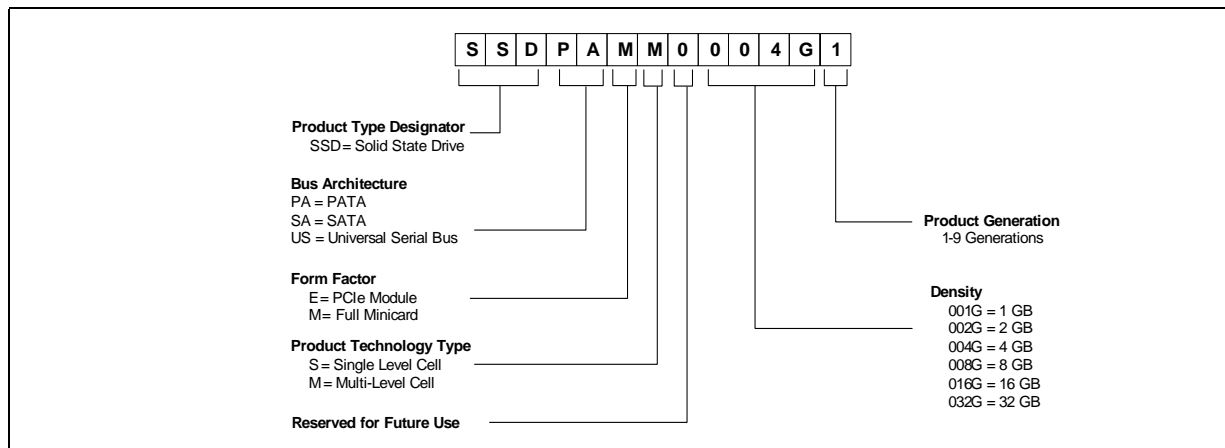
Product Manual

Product Features

- Capacities
  - 4 GB
  - 8 GB
  - 16 GB
- ONFI 1.0 compliant
- PATA Compatibility
  - ATA-5 compatible
  - UDMA4 supported
  - PIO Mode 4 supported
  - MWDMA Mode 2 supported
  - PATA ZIF connector
- Performance
  - Sustained Sequential Read Bandwidth: 38 MB/s
  - Sustained Sequential Write Bandwidth: 10 MB/s
- Form Factor
  - ZIF Connector
    - 1.8 in (W) x 0.9 in (L) x 0.13 in (H)
    - Weighs approximately 11 grams (TYP)
    - Suggested ZIF cable length: 3 in
  - Mini PCIe Form Factor
    - 1.18 in (W) x 2 in (L) x 0.15 in (H)
    - Weighs approximately 8 grams (TYP)

- Reliability
  - Mean Time Between Failure (MTBF) 1 Million Hours
  - 3 Years Useful Life
- Power Supply Voltage: 3.3 V ± 10% (TYP)
- Power Consumption (Vcc = 3.3 V)
  - Idle: <1 mW (TYP)
  - Active: 445 mW (TYP)
- Power Loss Protection: both hardware and firmware help prevent data corruption in the event of a power down during a WRITE cycle
- Temperature
  - Operating: 0^oC to 70^oC
  - Non-operating: 0^oC to 85^oC
- Shock and Vibration
  - Shock: 600 G/2 ms
  - Non-operating Vibration: 3.13 G, 5-500 Hz
  - Operating Vibration: 1.1 G, 5-40 Hz
- Compliances
  - Lead free
  - RoHS

Ordering Information

Intel Solid State Drive Product Name Decoder

| S | S | D | P | A | M | M | 0 | 0 | 0 | 4 | G | 1 |

Product Type Designator
SSD = Solid State Drive

Bus Architecture
PA = PATA
SA = SATA
US = Universal Serial Bus

Form Factor
E = PCIe Module
M = Full Minicard

Product Technology Type
S = Single Level Cell
M = Multi-Level Cell

Reserved for Future Use

Product Generation
1-9 Generations

Density
001G = 1 GB
002G = 2 GB
004G = 4 GB
008G = 8 GB
016G = 16 GB
032G = 32 GB

Intel Z-P230 PATA SSD Ordering Information

Part Number	Production MM #	Device Nomenclature	Packaging Production
SSDPAMM0004G1	898543	4 GB PATA SSD MLC ZIF Connector	100 pieces
SSDPAMM0008G1	898544	8 GB PATA SSD MLC ZIF Connector	100 pieces
SSDPAMM0016G1	899886	16 GB PATA SSD MLC ZIF Connector	100 pieces
SSDPAEM0004G1	899163	4 GB PATA SSD MLC PCIe Connector	100 pieces
SSDPAEM0008G1	899164	8 GB PATA SSD MLC PCIe Connector	100 pieces
SSDPAEM0016G1	899165	16 GB PATA SSD MLC PCIe Connector	100 pieces

Contents

1.0 Overview

The Intel® Z-P230 PATA Solid-State Drive (SSD) devices are available in either a 4 GB, 8 GB or 16 GB capacities featuring either a Zero Insertion Force (ZIF) connector or Mini PCIe form factor for notebooks. The targeted application is for notebook computers which require a small capacity and durable, low-power storage.

The Intel Z-P230 PATA SSD is electronically-drop-in compatible with mechanical PATA Hard Disk Drives, but delivers faster boot—the loading and execution of applications with no moving parts—leading to faster system responsiveness and longer battery life.

Figure 1.   Front View of the Intel Z-P230 PATA SSD with ZIF Connector
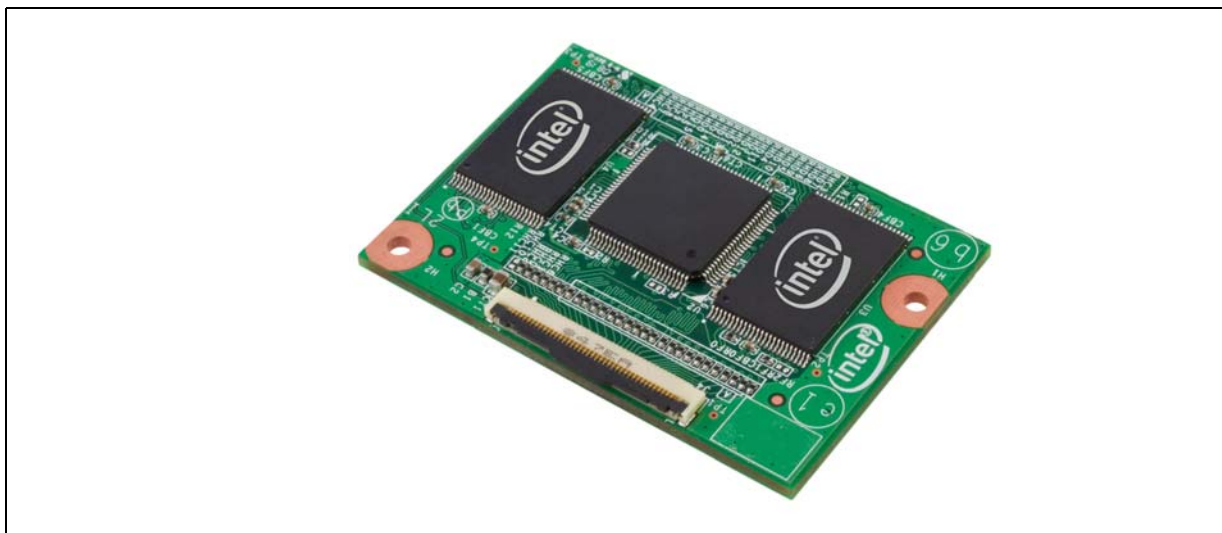
Figure 2.   Front View of the Intel Z-P230 PATA SSD with Mini PCIe Connector

1.1 Key Features

- 4 GB, 8 GB and 16 GB capacity
- ATA UDMA4 support
- ZIF connector or Mini PCIe form factor
- Weight
  - ZIF connector: approximately 11 grams
  - Mini PCIe form factor: approximately 8 grams
- Less than 1mW idle power (TYP)
- 445 mW active power (TYP)
- Uses Intel MLC NAND Flash Memory
- Sequential read: 38 MB/s
- Sequential write: 10 MB/s
- Footprint
  - ZIF connector: 38 mm (L) x 54 mm (W) x 3.2 mm (H)
  - Mini PCIe form factor: 50.95 mm (L) x 30 mm (W) x 3.8 mm (H)

1.2 Architecture

The Intel Z-P230 PATA Solid State Drive is a dual-channel PATA controller driven SSD available in a ZIF connector or mini PCIe form factor.

The PATA controller in the Intel® Z-P230 PATA Solid State Drive uses a microcontroller-based architecture that enables two flash memory channels to service read and write operations. See Figure 3, "Functional Block Diagram of Intel Z-P230 PATA Solid State Drive" on page 7. Capable of performing flash management functions, the SSD also implements internal wear leveling to minimize system overhead.

Intel Z-P230 PATA Solid State Drives use Intel MD516 NAND Flash Memory multi-level cell (MLC) thin-small outline package (TSOP) devices in three capacities: 4 GB, 8 GB and 16 GB. Refer to the *Intel MD516 NAND Flash Memory Datasheet* for details about this component. Please see Section 8.0, "Additional Product Information" on page 22 for more information.

Intel MLC NAND uses the industry-standard ONFI NAND flash memory command set that is capable of program page cache mode, page read cache mode, two plane commands and interleaved die operations.

1.3 Block Diagram

Figure 3. Functional Block Diagram of Intel Z-P230 PATA Solid State Drive
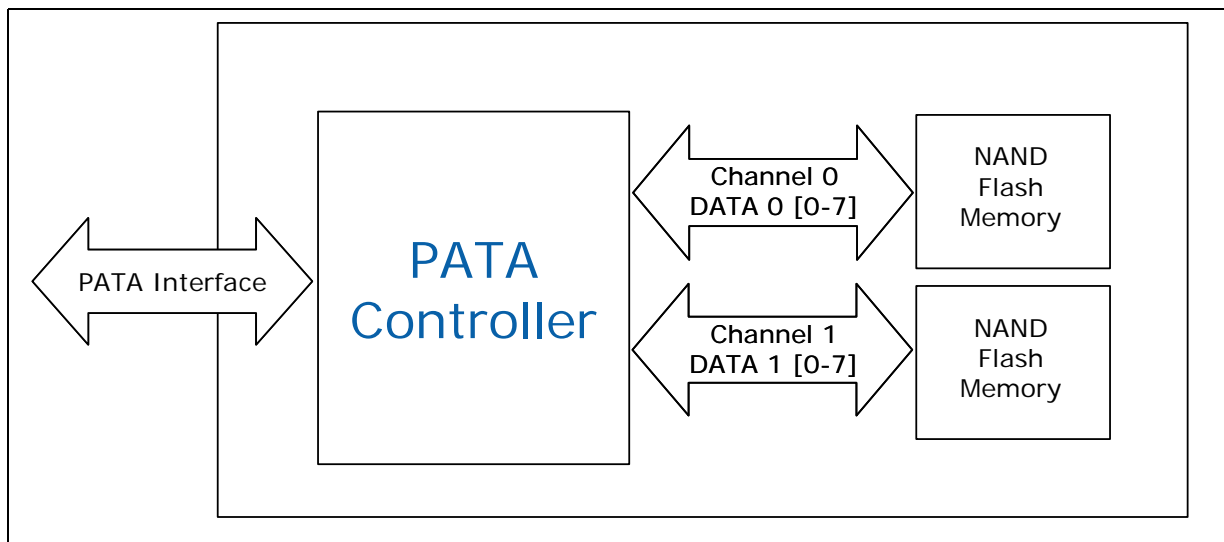
2.0 Regulatory Compliance

The Intel Z-P230 PATA SSD is compliant with the restriction of Hazardous Substances (RoHS) directive. It also conforms with standards of CE Mark for European consumer electronic compliance.

Since the Intel Z-P230 PATA SSD is intended to be contained solely within a personal computer or similar enclosure (not attached as an external device), the SSD is tested in representative end-user systems. While the Intel Z-P230 PATA SSD is EMC compliant (Specification EN55022), computer manufacturers and system integrators should confirm EMC compliance and provide CE marking for their products.

As a subassembly, no Federal Communications Commission verification or certification of the device is required. Intel Corporation has tested this device in enclosures to ensure that the SSD does comply with the limits for a Class B computing device, pursuant to Subpart J, Part 15 of the FCC rules.

Table 1. Device Compliance

Compliance	Description
CE	Indicates conformity with the essential health and safety requirements set out in European Directives Low Voltage Directive and EMC Directive.
PB Free	Components and materials are lead free.
RoHS	Restriction of Hazardous Substance Directive

3.0 Product Specifications

3.1 Capacity

Table 2. Capacity and User Addressable Sectors

Unformatted	User Addressable Sector in LBA mode
4 GB*	7,880,544
8 GB*	15,761,088
16 GB*	31,522,176

Note: Formatting and other functions will use some of the space, thus the listed capacity will not be available entirely for data storage.

3.2 Performance

Table 3. Read and Write Performance

Operation	Access Type	MB/second
READ	Sustained Sequential Read Bandwidth	38
WRITE	Sustained Sequential Write Bandwidth	10

Notes:
1. Queue depth is set to 1.
2. Device measured using IOmeter*.
3. Sampled, not tested.

3.3 Operating Conditions

3.3.1 Maximum Ratings

Stresses greater than those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress rating *only*, and functional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not guaranteed. Exposure to absolute maximum rating conditions for extended periods may affect reliability.

Table 4. Absolute Maximum Ratings by Device

Parameter	Symbol	Min	Max	Unit
Vcc supply voltage	Vcc	-0.6	+4.6	V
Non-operating temperature	Tstg	0	85	°C

3.3.2   Recommended Operating Conditions

Table 5.   Operating Temperature and Voltages

Parameter	Symbol	Min	Typ	Max	Unit
Operating temperature	T$_A$	0	-	70	°C
Vcc supply voltage	Vcc	3.0	3.3	3.6	V
Ground supply voltage	Vss	0	0	0	V

3.4   Electrical Characteristics

Table 6.   Power Consumption

Setting	Value
Active Current	135 mA (TYP)
Active Idle Current	30 mA (TYP)
Idle Current	235 uA (TYP)
Active Power	445 mW
Idle Power	<1 mW

Notes:
1.   Using UDMA 4 program mode, calculation based on worst case workload condition.
2.   Idle power is measured using active power management.
3.   Sampled, not tested.

3.5   Environmental Conditions
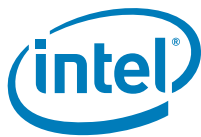
3.5.1   Temperature

Table 7.   Temperature Specifications

	Mode	Min	Max	Unit
Ambient Temperature	Operating	0	70	°C
	Non-Operating	0	85	°C

3.5.2   Altitude

Since there are no moving parts, this device is not susceptible to a lack of air molecules and will operate correctly to 50,000 feet above sea level.

3.5.3 Shock and Vibration

Table 8. **Shock and Vibration Characteristics**

Condition	Value
Non-operating shock	600 G/2 mS
Non-operating vibration	5-500 Hz; 3.13 G
Operating vibration	5-40 Hz; 1.1 G

Notes:
1.   Shock specifications assumes that the SSD is mounted securely with the input vibration applied to the drive mounting screws. Vibration may be applied in the X, Y or Z axis.
2.   Vibration specifications assumes that the SSD is mounted securely with the input vibration applied to the drive mounting screws. Vibration may be applied in the X, Y or Z axis.

3.5.4 Acoustics

This drive has no moving or noise-emitting parts; therefore, it produces negligible sound (0dB) in all modes of operation.

3.5.5 Electrostatic Discharge (ESD)

The Intel Z-P230 PATA SSD can withstand an electrostatic discharge of +/- of 4 KV. ESD testing is done to demonstrate that the units can withstand discharge encountered in normal handling or operations of the equipment.

3.6 Reliability

Table 9. **Reliability Specifications**

Parameter	Value
Mean Time Between Failure (MTBF)	1,000,000 hours
Non-recoverable read errors	1 sector per 10^{15} bits read, max
Useful Life	3 years[1,2]

Notes:
1.   Based on 60% random workload of 1GB/day on 4GB sku, 2GB/day on 8GB sku and 4GB/day on 16GB sku.
2.   60% of MB data written is random.

4.0   Mechanical Information

Figure 4.   Intel Z-P230 PATA SSD with ZIF Connector (Top, Side and Bottom Views)
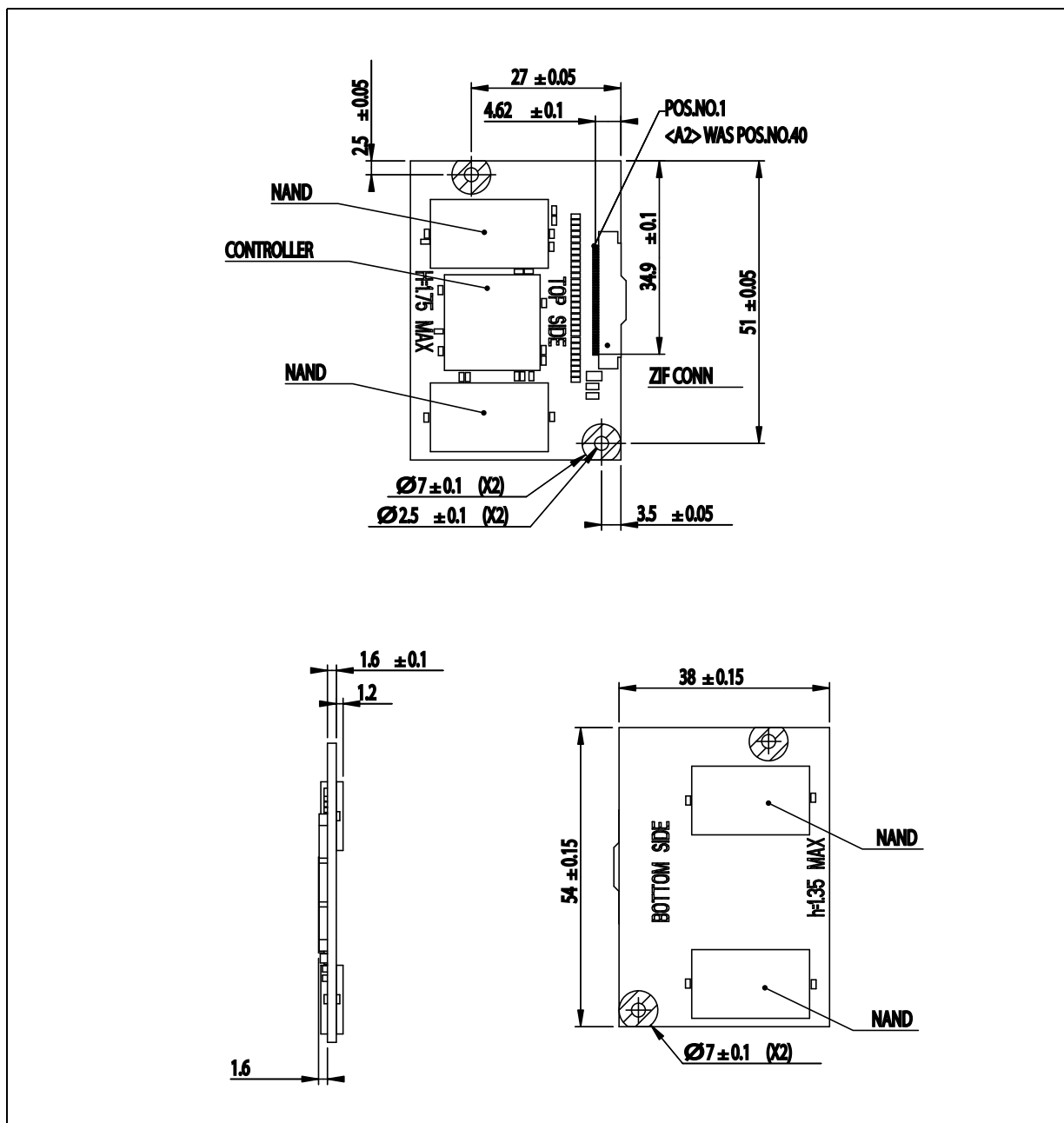
Notes:
1.   All dimensions are in millimeters.
2.   Card thickness to be 1.6 ± 0.1 mm, including solder plating unless otherwise specified.
3.   Solder plating thickness to be 0.05 mm MAX TYP.
4.   Coordinates indicate the center of this connector, or the center of the positioning pin/hole, or the location of #pin
5.   Suggested ZIF cable length is 3 inches.

Figure 5.   ZIF Connector Dimensions (Top, Side and Profile Views)
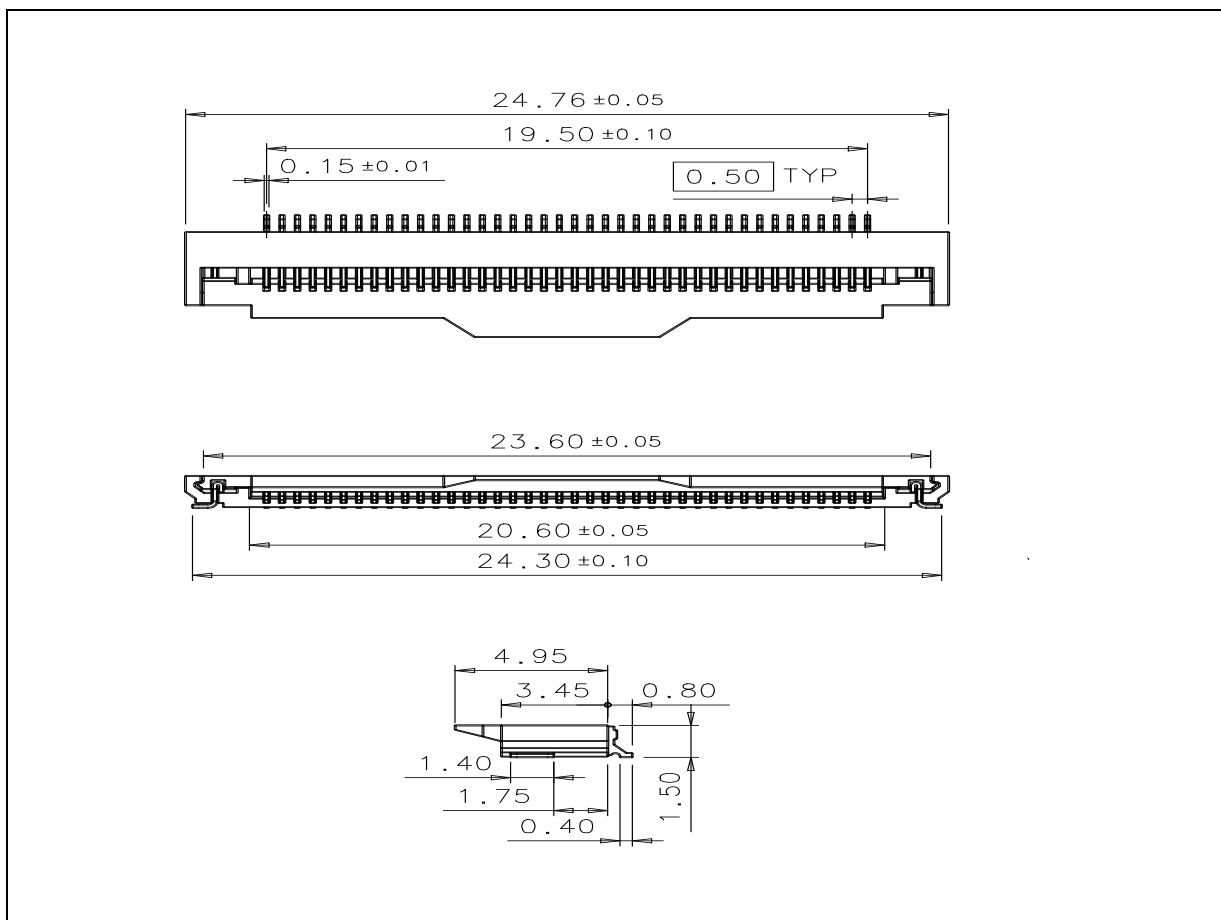
Note: All dimensions are in millimeters.

Figure 6. **Intel Z-P230 PATA SSD with Mini PCIe Connector (Top, Side and Bottom Views)**
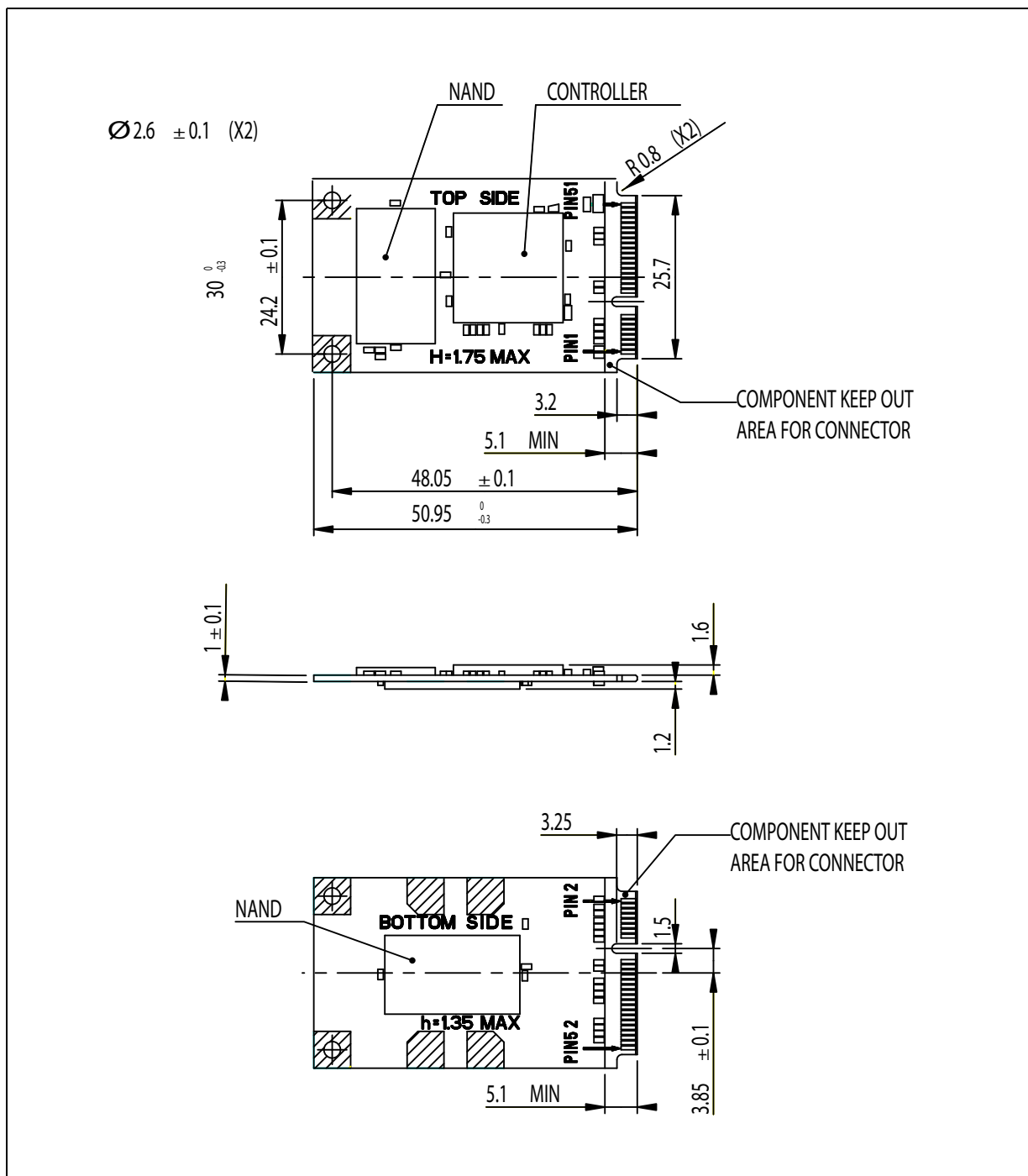
Notes:
1. All dimensions are in millimeters.
2. Card thickness to be 1.0 ± 0.1 mm, including solder plating unless otherwise specified.
3. Solder plating thickness to be 0.05 mm MAX TYP.
4. Coordinates indicate the center of this connector, or the center of the positioning pin/hole, or the location of #pin.

5.0   Pin Assignments and Signal Descriptions

5.1   Pin Assignments

Table 10.   Intel Z-P230 with ZIF Connector - 40 Pin Assignments

Pin Number	Signal	Pin Number	Signal	Pin Number	Signal	Pin Number	Signal
1	Reserved	11	DQ4	21	GND	31	DA1
2	Reserved	12	DQ11	22	DMARQ	32	PDIAG#
3	RESET#	13	DQ3	23	GND	33	DA0
4	GND	14	DQ12	24	DIOW#	34	DA2
5	DQ7	15	DQ2	25	DIOR#	35	CS0#
6	DQ8	16	DQ13	26	GND	36	CS1#
7	DQ6	17	DQ1	27	IORDY	37	DASP#
8	DQ9	18	DQ14	28	GND	38	VCC
9	DQ5	19	DQ0	29	DMACK#	39	VCC
10	DQ10	20	DQ15	30	INTRQ	40	Reserved

Table 11.   Intel Z-P230 with Mini PCIe Form Factor - 52 Pin Assignments

Pin Number	Signal	Signal	Pin Number
1	DQ0	DQ15	2
3	DQ1	GND	4
5	DQ2	DQ14	6
7	DQ3	DQ13	8
9	GND	DQ12	10
11	DQ4	DQ11	12
13	DQ5	DQ10	14
15	GND	DQ9	16
	Mechanical Key		
17	DQ6	GND	18
19	DQ7	DQ8	20
21	GND	RESET#	22
23	NC	DIOW	24
25	NC	NC	26
27	GND	DIOR	28
29	GND	DMACK#	30
31	NC	DMARQ	32
33	NC	GND	34
35	GND	NC	36
37	DA0	NC	38
39	DA1	GND	40

Table 11.   Intel Z-P230 with Mini PCIe Form Factor - 52 Pin Assignments

Pin Number	Signal	Signal	Pin Number
41	DA2	IORDY	42
43	NC	INTRRQ	44
45	NC	CS0#	46
47	VCC	CS1#	48
49	VCC	GND	50
51	VCC	NC	52

Note: The Mini PCIe form factor does not use the DASP# or PDAIG signals.

5.2   Signal Descriptions

Table 12.   Signal Symbols and Descriptions

Symbol	Type	Description
CS0#, CS1#	Input	The host uses CS0# to select task file registers and CS1# to select alternate status registers and other device control register.
DA[0...2]	Input	Device address signals used by the host to access device registers or data port.
DASP#	Input/Output	The Device Active/Slave Present signal. **Note**: the Mini PCIe form factor does not use this signal.
DIOR#	Input	The I/O Read Enable signal is the strobe signal asserted by the host to read device registers or the data port.
DIOW#	Input	The I/O Write Enable signal is the strobe signal asserted by the host to write device registers or the data port.
DMACK#	Input	The host uses the DMA Acknowledge signal to acknowledge the receipt of the DMA Request and that it is ready to initiate DMA transfers.
DMARQ	Output	The DMA Request signal is asserted by the drive when it is ready for data transfer between it and the host. IORD and IOWR signals are used to control the direction of data transfer.
DNU		Do Not Use. Must be left unconnected.
DQ[0...15]	Input/Output	16-bit bidirectional I/O interface.
GND	Supply	Ground connection.
INTRQ	Output	Device uses the Interrupt Request signal to interrupt the host.
IORDY	Output	The device asserts the I/O Ready signal to tell the host to extend the host transfer cycle.
NC		Not connected.
PDIAG#	Input/Output	The Pass Diagnostic signal is used by the master/slave handshake protocol to determine if the device has passed diagnostics. **Note**: the Mini PCIe form factor does not use this signal.
Reserved		Reserved for Future Use.
RESET#	Input	The host asserts this signal to reset the device.
VCC	Supply	Power supply.
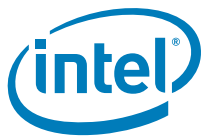
6.0   Command Sets

The Intel® Z-P230 PATA SSD device supports all the mandatory ATA commands as defined in the ATA/ATAPI-5 specification.

6.1   ATA General Feature Command Set

The Intel® Z-P230 PATA SSD device supports the ATA General Feature command set (non-PACKET).

Table 13.   ATA General Feature Commands

Command Name	Code
EXECUTE DEVICE DIAGNOSTIC	90h
IDENTIFY DEVICE	ECh
IDENTIFY DEVICE DMA	EEh
INITIALIZE DRIVE PARAMETERS	91h
NOP	00h
READ BUFFER	E4h
READ DMA	C8h, C9h
READ LONG	22h, 23h
READ MULTIPLE	C4h
READ NATIVE MAX ADDRESS	F8h
READ SECTOR(S)	20h, 21h
READ VERIFY SECTOR(S)	40h, 41h
RECALIBRATE	1Xh
SEEK	7Xh
SET FEATURES	EFh
SET MULTIPLE MODE	C6h
SMART	B0h
TRANSLATE SECTOR	87h
WRITE BUFFER	E8h
WRITE DMA	CAh, CBh
WRITE LONG	32h, 33h
WRITE MULTIPLE	C5h
WRITE MULTIPLE without ERASE	CDh
WRITE SECTOR(S)	30h, 31h
WRITE SECTOR(S) without ERASE	38h
WRITE VERIFY	3Ch

6.1.1   IDENTIFY DEVICE DATA

The following table details the data returned after issuing an IDENTIFY DEVICE (ECh) command.

Table 14.   Returned Sector Data

Word	Default Value	Bytes	Description
0	044Ah	2	General configuration bit-significant information
1	4 GB: 1E8Ah 8 GB: 3D14h 16 GB: 3FFFh	2	Default number of Logical cylinders
2	0000h	2	Reserved
3	0010h	2	Default number of Logical heads
4	7E00h	2	Retired
5	0200h	2	Retired
6	003Fh	2	Default number of logical sectors per logical track
7-8	XXXX	4	Reserved for assignment by the CompactFlash* Association
9	0000h	2	Reserved
10-19	XXXX	20	Serial number (20 ASCII characters)
20	0002h	2	Retired/obsolete
21	0002h	2	Retired/ Obsolete
22	0004h	2	Retired/ Obsolete
23-26	XXXX	8	Firmware revision (8 ASCII characters)

Table 14. Returned Sector Data (Continued)

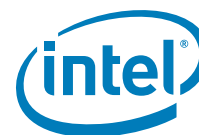| Word	Default Value	Bytes	Description

27-46	4 GB: 5353h, 4450h
	414Dh, 4D30h
	3030h, 3447h
	3120h, 2020h
	2020h, 2020h
	2020h, 2020h
	2020h, 2020h
	2020h, 2020h
	2020h, 2020h
	
	8 GB: 5353h, 4450h
	414Dh, 4D30h
	3030h, 3847h
	3120h, 2020h
	2020h, 2020h
	2020h, 2020h
	2020h, 2020h
	2020h, 2020h
	2020h, 2020h
	2020h, 2020h
	
	16 GB: 5353h, 4450h
	414Dh, 4D30h
	3031h, 3647h
	3145h, 5320h
	2020h, 2020h
	2020h, 2020h
	2020h, 2020h
	2020h, 2020h
	2020h, 2020h
	2020h, 2020h
		40	Model number (40 ASCII characters)
			Default Value column shows the hex values for ZIF connector based sku:
			  4 GB: SSDPAMM0004G1
			  8 GB: SSDPAMM0008G1
			16 GB: SSDPAMM0016G1
			
			Other hex values include:
			
			Production SSD with Mini PCIe connector:
			  4 GB: SSDPAEM0004G1
			  5353h, 4450h, 4145h, 4D30h, 3030h, 3447h, 3120h, 2020h, 2020h, 2020h, 2020h, 2020h, 2020h, 2020h, 2020h, 2020h, 2020h, 2020h, 2020h, 2020h
			  8 GB: SSDPAEM0008G1
			  5353h, 4450h, 4145h, 4D30h, 3030h, 3847h, 3145h, 5320h, 2020h, 2020h, 2020h, 2020h, 2020h, 2020h, 2020h, 2020h, 2020h, 2020h, 2020h, 2020h
			  16 GB: SSDPAEM0016G1
			  5353h, 4450h, 4145h, 4D30h, 3031h, 3647h, 3145h, 5320h, 2020h, 2020h, 2020h, 2020h, 2020h, 2020h, 2020h, 2020h, 2020h, 2020h, 2020h, 2020h

47	8001h	1	Maximum number of sectors transferred per interrupt on Read/Write Multiple command 1 = for a single-channel card 2 = two-channel card
48	0000h	2	Reserved
49	2B00	2	Capabilities: DMA, LBA, IORDY, and standby timer functions supported
50	4000h	2	Capabilities
51	0200h	2	Obsolete
52	0000h	2	Obsolete
53	0007h	2	Data fields 54 to 58, 64 to 70 and 88 are valid
54	4 GB: 1E8Ah 8 GB: 3D14h 16 GB: 3FFFh	2	Number of current logical cylinders. Obsolete.
55	0010h	2	Number of current logical heads. Obsolete.
56	003Fh	2	Number of current logical sectors per logical track. Obsolete.
57-58	4 GB: 3F60h, 0078h 8 GB: 7EC0h, 00F0h 16 GB: 00FBh, FC10h	4	Current capacity in sectors. Obsolete
59	0101h	2	Multiple sector setting is valid

Table 14.   Returned Sector Data (Continued)

Word	Default Value	Bytes	Description
60-61	4 GB: 3F60h, 0078h 8 GB: 7EC0h, 00F0h 16 GB: 01E0h, FD80h	4	Total number of sectors addressable in LBA mode
62	0000h	2	Obsolete
63	0007h	2	Multi-word DMA transfer mode - 2, 1, 0
64	0003h	2	Advanced PIO Modes - 4, 3, 2, 1, 0
65	0078h	2	Minimum multi word DMA cycle time per word
66	0078h	2	Recommended multi word DMA cycle time
67	0078h	2	Minimum PIO cycle time without flow control
68	0078h	2	Minimum PIO cycle time IORDY with flow control
69-79	0000h	22	Reserved
80	0030h	2	Major version number, ATA-4 and ATA-5 support
81	0000h	2	Minor version number, not reported
82	700Bh	2	Command set: READ BUFFER, WRITE BUFFER, power management feature set, NOP, SMART, Removable Media feature set
83	5004h	2	Command set: FLUSH CACHE, CFA feature set
84	4000h	2	Command set/feature supported extension
85	7009h	2	Command set enabled: READ BUFFER, WRITE BUFFER, NOP, power management feature set, SMART feature set
86	1004h	2	Command set enabled: FLUSH CACHE, CFA feature set
87	4000h	2	Command set/feature default.
88	203Fh	2	UDMA mode 4 and below are supported.
89	001Eh	2	Time required for security erase unit completion
90	001Eh	2	Time required for enhanced security erase unit completion
91	0000h	2	Current advanced power management value
92	FFFEh	2	Master Password Revision Code
93	0000h	2	Hardware reset result
94-127	0000h	68	Reserved
128	0029h	2	Security status
129	0003h	2	Vendor specific
130-159	0000h	60	Reserved
160	1000h	2	CFA Power mode 1 (Disabled)
161-255	0000h	190	Reserved

6.1.2 READ MULTIPLE and WRITE MULTIPLE Command Value

Set the following value when executing READ MULTIPLE (C4h) and WRITE MULTIPLE (C5h) commands.

Table 15. Set Multiple Commands Parameter

Feature	Sector Count Register Value
Set sectors per block to use on all subsequent READ MULTIPLE (C4h) and WRITE MULTIPLE (C5h) commands.	01h

6.1.3 SET FEATURES Subcommands

The following table identifies the subcommands for the SET FEATURES (EFh) command.

Table 16. Subcommands for the SET FEATURES Command

Subcommand Name	Feature Register Value
Enable 8-bit data transfer	01h
Set transfer mode based on value in	03h
Disable Read Look Ahead	55h
Disable Power on Reset (POR) establishment	66h
NOP - Accepted	69h
Disable 8-bit data transfer	81h
NOP - Accepted	96h
Accepted for backward compatibility	97h
Set host current source capability	9Ah
4 bytes of data applied on READ/WRITE	BBh
Enable Power on Reset (POR) establishment	CCh

6.1.4 SMART Subcommand Set

The SMART RETURN STATUS (DAh) command returns a pass/fail value based on the current status of the Z-P230 PATA SSD. The BIOS or system software that interfaces to SMART should issue this command at boot up and upon resume from a standby or hibernate condition. If the status returned is PASS, the boot up or resume sequence should continue as normal. If however the status returned is FAIL, the BIOS or system software should issue a warning to the end user that their SSD is approaching it's drive wear-out condition and recommend that the end user back up their SSD.

The following table details the register value for each of the subcommands available when using the SMART (B0h) command:

Table 17. SMART Subcommands

Subcommand Name	Feature Register Value
SMART READ ATTRIBUTE	D0h
SMART READ ATTRIBUTE THRESHOLDS	D1h
SMART ENABLE ATTRIBUTE AUTOSAVE	D2h*

Table 17.   SMART Subcommands (Continued)

Subcommand Name	Feature Register Value
SMART DISABLE ATTRIBUTE AUTOSAVE	D2h*
SMART ENABLE OPERATION	D8h
SMART DISABLE OPERATIONS	D9h
SMART RETURN STATUS	DAh

Note: The Sector Count Register value determines whether to implement SMART ENABLE ATTRIBUTE AUTOSAVE (F1h) or SMART DISABLE ATTRIBUTE AUTOSAVE (00h).

6.2   Power Management Command Set

The Intel® Z-P230 PATA SSD devices support the Power Management command set.

Table 18.   Power Management Commands

Command Name	Code
CHECK POWER MODE	E5h, 98h
IDLE	E3h, 97h
IDLE IMMEDIATE	E1h, 95h
SLEEP	E6h, 99h
STANDBY	E2h, 96h
STANDBY IMMEDIATE	E0h, 94h

7.0   References

This document also references standards and specifications defined by a variety of organizations. Please use the following information to identify the location of an organization's standards information.

Table 19.   Standards References

Date or Revision Number	Title	Location
February 2000	ATA-5	http://www.t13.org/Documents/UploadedDocuments/project/d1321r3-ATA-ATAPI-5.pdf
January 2007	JEDEC Standard: Electrostatic Discharge (ESD) Sensitivity Testing Human Body Model (HBM)	http://www.jedec.org/download/search/default2.cfm
December 2004	JEDEC Standard JESD22-C101C: Field-Induced Charged-Device Model Test Method for Electrostatic-Discharge-Withstand Thresholds of Microelectronic Components	http://www.jedec.org/download/search/default2.cfm
December 2006	Open NAND Flash Interface (ONFI) Specification 1.0	http://www.onfi.org/docs/ONFI_1_0_Gold.pdf

8.0 Additional Product Information

For detailed information about a product mentioned in this document, please refer to the corresponding datasheet or application note.

Table 20. Addition Product Information

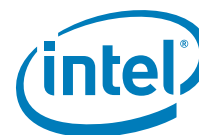| Order Number	Title	Type*
316339-003US	Intel® MD516 NAND Flash Memory Datasheet	Production

Note: Customers who request access to *Advanced* datasheets must have a a non-disclosure agreement (NDA) with Intel. We release *Advanced* datasheets prior to *Preliminary* datasheets, which are released around the time a product is sampled. *Production* datasheets become available when the part is mass produced. To obtain a copy of these documents, please contact your Intel field sales representative.

9.0 Glossary

This document incorporates many industry- and device-specific words. Use the following list to define a variety of terms and acronyms.

Table 21. Glossary of Terms and Acronyms

Term	Definition
ATA	Advanced Technology Attachment
CE	The CE conformity marking applies to products regulated by certain European health, safety and environmental protection legislation.
CFA	CompactFlash Association
CPRM	Content Protection for Recordable Media
CRC	Cyclic Redundancy Check
DDP	Dual Die Package
DMA	Direct Memory Access
ECC	Error Correction Code
EMC	ElectroMagnetic Compatibility
ESD	Electrostatic Discharge
FCC	Federal Communications Commission
GB	Giga-byte. Defined as 1×10^9 bytes. Please note that some of the listed capacity is used for formatting and other functions, and therefore, is not available for data storage.
HDD	Hard Disk Drive
IDE	Integrated Device Electronics
LBA	Logical Block Addressing
MB	Mega-byte. Defined as 1×10^6 bytes. Please note that some of the listed capacity is used for formatting and other functions, and therefore, is not available for data storage.
Mini PCIe	Mini Peripheral Component Interconnect Express (PCIe)
MLC	Multi-Level Cell
MTBF	Mean Time Between Failure
MWDMA	Multi-Word DMA
NOP	No Operation
ODM	Original Design Manufacturer

Table 21. Glossary of Terms and Acronyms (Continued)

Term	Definition
OEM	Original Equipment Manufacturer
ONFI	Open NAND Flash Interface
PATA	Parallel ATA
PIO	Programmable Input / Output
QDP	Quad Die Package
SDP	Single Die Package
SSD	Solid state drive
UDMA	Ultra DMA, also know Ultra ATA
ZIF	Zero Insertion Force

10.0 Revision History

Date	Revision	Description
September 2008	003	Updated the Decoder and "Intel Z-P230 PATA SSD Ordering Information" on page 2. Updated Section 6.1.4, "SMART Subcommand Set" on page 20 Added footnote to Table 9, "Reliability Specifications" on page 10 Updated mechanical drawing of ZIF module Figure 4, "Intel Z-P230 PATA SSD with ZIF Connector (Top, Side and Bottom Views)" on page 11 Modified values and content in the following tables: • Table 6, "Power Consumption" on page 9 • Table 14, "Returned Sector Data" on page 17
July 2008	002	Updated values and added Mini PCIe data on the front page. Updated the Decoder and "Intel Z-P230 PATA SSD Ordering Information" on page 2. Modified Section 1.0, "Overview" on page 5 and Section 1.1, "Key Features" on page 6. Added the following sections: • Section 1.2, "Architecture" on page 6 • Section 8.0, "Additional Product Information" on page 22 Modified Figure 3, "Functional Block Diagram of Intel Z-P230 PATA Solid State Drive" on page 7. Added the following tables: • Table 7, "Temperature Specifications" on page 9 • Table 11, "Intel Z-P230 with Mini PCIe Form Factor - 52 Pin Assignments" on page 14 Added the following figures: • Figure 2, "Front View of the Intel Z-P230 PATA SSD with Mini PCIe Connector" on page 5 • Figure 6, "Intel Z-P230 PATA SSD with Mini PCIe Connector (Top, Side and Bottom Views)" on page 13 Modified values and content in the following tables: • Table 2, "Capacity and User Addressable Sectors" on page 8 • Table 3, "Read and Write Performance" on page 8 • Table 13, "ATA General Feature Commands" on page 16 • Table 14, "Returned Sector Data" on page 17 • Table 21, "Glossary of Terms and Acronyms" on page 22
June 2008	001	Initial Release. Earlier information released as Castle Point PATA Modular Solid State Drive Advance Datasheet - 319546-002US.