ATP SATA-III M.2 2280 SSD (HWPLP)
A600Sc

Datasheet

Version 3.1

P/N
AF120GSTIC-7BEXP
AF240GSTIC-7BEXP
AF480GSTIC-7BEXP
AF960GSTIC-7BEXP

ATP SATA-III M.2 2280 SSD
Product Summary/Features

- Capacities:
  - 120GB, 240GB, 480GB, 960GB
- Form Factors:
  - M.2 2280-D2-B-M
- Thickness:
  - Up to 3.35mm
- Weight:
  - < 10 grams
- SATA 6Gb/s performance:
  - Sequential Read: Up to 560MB/s
  - Sequential Write: Up to 510MB/s
- Read and Write IOPS (QD32)
  - Random 4K Reads: Up to 100,000 IOPS
  - Random 4K Writes: Up to 88,000 IOPS
- Data Reliability
  - LDPC (Low Density Parity Check) ECC algorithm
  - RAID support for uncorrectable error recovery
- End-to-End Data Path Protection
- Hardware-Based Power Loss Protection (HW-PLP): Ensures Data-In-Flight Integrity
- Compliant with Serial ATA Revision 3.2
- Compliant with M.2 Specification V1.0 defined by PCI-SIG
- Support
  - SMART ATA feature set
  - NCQ (Native Command Queue)
  - TRIM command
  - Global wear-leveling
  - Thermal throttling mechanism

- Power Management
  - 3.3V SATA Supply Voltage
  - SATA Link Power Management (LPM)
- Temperature, Case (T_C)
  - Operating: 0°C to 70°C
  - Non-Operating: -40°C to 85°C
- Reliability
  - MTBF: 2M hours
  - Shock (Operating): Half Sine 1,500G /0.5ms
  - Vibration (Operating): Sine 16.4G /10~2000Hz
  - Data Retention (@30°C): 5 Years (with 10% P/E Cycles)
- Endurance (TBW in Sequential Write)
  - 120GB: 349TB
  - 240GB: 698TB
  - 480GB: 1,396TB
  - 960GB: 2,792TB
- Certifications, Declarations
  - CE
  - FCC
  - BSMI
  - UKCA
- Product Ecological Compliance
  - RoHS
  - REACH

CONTENT

Disclaimer

ATP Electronics Inc. shall not be liable for any errors or omissions that may appear in this document and disclaims responsibility for any consequences resulting from the use of the information set forth herein.

ATP may make changes to specifications and product descriptions at any time, without notice. The information in this paper is furnished for informational use only so ATP assumes no responsibility or liability for any errors or inaccuracies that may appear in this document.

All parts of the ATP documentation are protected by copyright law and all rights are reserved. This documentation may not, in whole or in part, be copied, photocopied, reproduced, translated, or reduced to any electronic medium or machine-readable form without prior consent, in writing, from ATP Electronics, Inc.

Notwithstanding any clause of this Agreement, Supplier are not warranted and liable for use any Product in developing, or for incorporation into, products or services used in applications or environments requiring failsafe performance, such as in the operation of nuclear facilities, aircraft navigation or air traffic control, life support machines, surgically implanted devices, weapons systems, or other applications, devices or systems in which the failure of Product could lead directly to death, personal injury, or severe physical or environmental damage.

The information set forth in this document is considered to be "Proprietary" and "Confidential" property owned by ATP.

© Copyright ATP all rights reserved.

Revision History

Date	Version	Changes compared to previous issue
Sept. 17th, 2021	3.0	- 1st release.
Mar. 17th, 2022	3.1	- update Hardware PLP description

1.0 Product Specification

1.1 Product Image
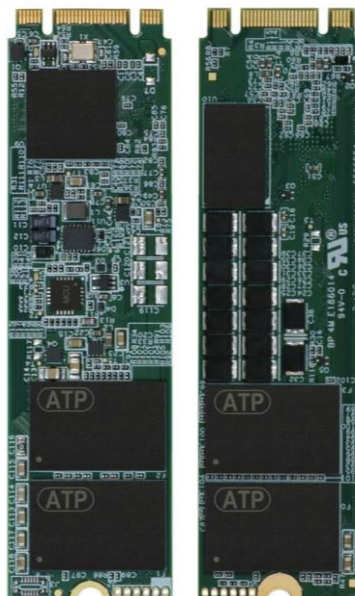
Figure 1-1: ATP Product Image (For reference)

1.2 Capacity

Table 1-2: Capacity Settings

Capacity	LBA[1,2]
120GB	234,441,648
240GB	468,862,128
480GB	937,703,088
960GB	1,875,385,008

1. Sector size is 512 bytes
2. LBA counts are based on IDEMA (LBA1-03) standard
3. The total usable capacity of SSD may be less than physical capacity due to a few of spare block being used for the purposes of NAND management or FW operating.

1.3 Environment Specifications

Table 1-3-1: Environment Specification

Type		Standard
Temperature, Case (T_C)[1]	Operating	0°C to 70°C
	Non-Operating	-40°C to 85°C
Airflow[2,3,4]	Operating	600 LFM @ Max. T_C
Rate of Temp. Change	Operating	1~2°C / minute
Relative Humidity	Operating	8% to 95%, noncondensing
	Non-Operating	8% to 93%, noncondensing
Vibration	Operating	Sine 16.4G, 10~2000Hz
Shock	Operating	Half sine 1500G/0.5ms

1. Case temperature, the device temperature as indicated by SMART temperature attribute. (ID:194)
2. Sufficient airflow is recommended for 100% sequential writes as the SSD approaches the case temperature in effort to maintain best performance. In the case the SSD temperature exceeds the assigned case temp, the SSD will throttle the performance to mitigate thermal challenges.
3. Airflow is measured upstream of the drive and flows parallel to and through any cooling fins.
4. For more information, please contact your local ATP representative.

1.4 Reliability

Table1-4: Reliability

Type	Value
MTBF (Ta@ 25°C) [1]	>2,000,000 hours
Data Retention (Ta@ 30°C)[2]	5 years (with 10% P/E cycle)

1. The Mean Time between Failures (MTBF) is calculated using a prediction methodology, Telcordia SR-332, which based on reliability data of the individual components in drive. It assumes nominal voltage, with all other parameters within specified range.
2. Data retention value may vary across different temperature range and is experimental result to be used for reference.

1.5   Electrical Characteristics

Table 1-5-1: Supply Power

Parameter	Symbol	Min	Typ.	Max	Unit	Remark
Supply voltage	V_{CC}	3.14	3.3	3.46	V	

Table 1-5-2: Power Consumption Measurement[1,2]

120GB

Parameter	Symbol	Min	Typ.	Max	Unit	Remark
Sustained write power	P_W	-	2.5	3.5	W	RMS value
Sustained read power	P_R	-	2.0	2.5	W	RMS value
Idle power	P_S	-	0.7	1.0	W	RMS value

240GB

Parameter	Symbol	Min	Typ.	Max	Unit	Remark
Sustained write power	P_W	-	2.6	4.5	W	RMS value
Sustained read power	P_R	-	2.5	3.0	W	RMS value
Idle power	P_S	-	0.7	1.0	W	RMS value

480GB

Parameter	Symbol	Min	Typ.	Max	Unit	Remark
Sustained write power	P_W	-	2.7	4.8	W	RMS value
Sustained read power	P_R	-	2.6	3.5	W	RMS value
Idle power	P_S	-	0.7	1.0	W	RMS value

960GB

Parameter	Symbol	Min	Typ.	Max	Unit	Remark
Sustained write power	P_W	-	2.7	5.0	W	RMS value
Sustained read power	P_R	-	2.7	3.5	W	RMS value
Idle power	P_S	-	0.7	1.0	W	RMS value

1.   All power measured is under room temperature and using SATA3 interface.
2.   Power measured under 100% sequential read mode or 100% sequential write mode with 1023MB data transfers.

1.6 IOPS

Table 1-6: IOPS[1,2,3] (QD32) (Up to)

Capacity	4K Random Read IOPS (QD32)	4K Random Write IOPS (QD32)
120GB	66,000	83,000
240GB	100,000	88,000
480GB	100,000	88,000
960GB	100,000	88,000

1. IOPS may vary by application/system usage
2. IOPS is calculated by dividing capacity by (4K QD32 testing result)/4x1024
3. The testing is assumed under clean state

1.7 Maximum Read/Write Performance

Table 1-7: Performance[1,2] (Up to)

Type	Capacity	Sequential Read	Sequential Write
Crystal Disk Mark	120GB	560 MB/s	470 MB/s
	240GB	560 MB/s	510 MB/s
	480GB	560 MB/s	470 MB/s
	960GB	560 MB/s	460 MB/s

1. Performance may vary by application/system usage.
2. Performance is measured by CrystalDiskMark. The testing drive is assumed under clean state.
3. All performance measured is under room temperature.

1.8 Write/Erase Endurance[1]

Table 1-8: TBW[1]

Capacity	Random write[2] (JEDEC Enterprise)	Sequential write[3]
120GB	48 TB	349 TB
240GB	153 TB	698 TB
480GB	307 TB	1,396 TB
960GB	614 TB	2,792 TB

1. Endurance can be predicted based on the usage conditions applied to the device, the internal NAND component cycles, the write amplification factor, and the wear leveling efficiency of the drive. TBW may vary depending on application, please contact ATP for TCO evaluation if specific usage type applies.
2. The random endurance calculation is based on JESD219A Enterprise workload.
3. The sequential write endurance calculation is based on pure sequential write at 128K transfer size to run in 4K alignment test pattern

2.0 Product Overview

2.1 Block Diagram

ATP SSD consists of below functional blocks. The advanced architecture is optimized to provide highest data reliability and transfer performance.
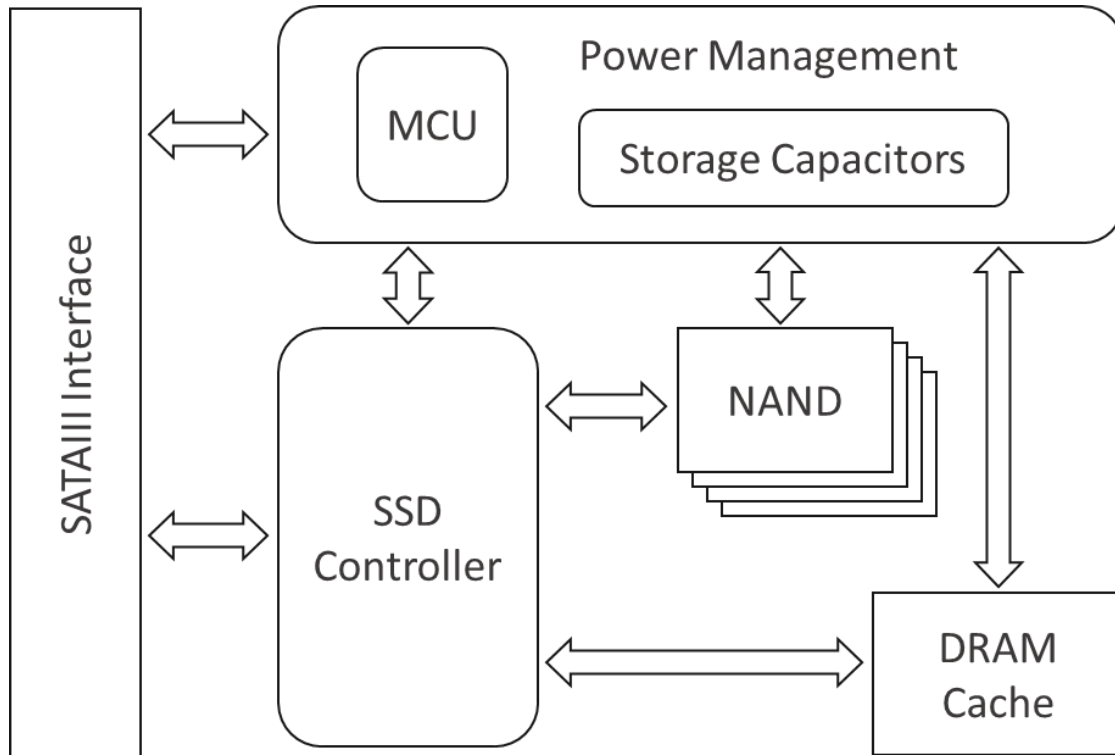
Figure 2-1: Block diagram for ATP SATAIII SSD

2.2 Hardware-Based Power Loss Protection --- Data-In-Flight Integrity Under Power-cycling

Many applications may suffer from a sudden power loss event which may lead to the risk of data loss or drive corruption.

To prevent SSD failure during a sudden power loss event, this product has onboard power loss protection (PLP). PLP provides the SSD with sufficient backup power to safely store any inflight data and gracefully shutdown the SSD. This feature takes any burden off the host system to manage a safe shutdown of the SSD, therefore simplifying the host design.

Th power abnormality is identified by a power loss detection circuit which activates the power protection mechanism. The SSD then draws power from the onboard power reserve, which provides enough time for the flash device to conclude the last commands without losing any data or corruption of data.

2.3 Auto-Refresh Technology --Data Integrity Protection

Over time the error bits accumulate to the threshold in the flash memory cell and eventually become uncorrectable despite the use of an ECC engine. In the traditional handling method, the data is moved to a different location in the flash memory; despite the corrupted data is beyond repaired before the transition.

The situation is worse in frequent read applications, such as navigation systems or OS boot-up devices. The map or operating system is preloaded into the storage media and there may be one time write and following by read operation only. Read disturbance is the result of electrical interference from multiple read operations in surrounding cells. After NAND flash accumulates 100,000 read cycles, uncorrectable ECC errors may occur in the affected pages which results in data failure in the same block.

To prevent data corruption, ATP memory product monitors the error bit levels in each read operation. When it reaches the preset threshold value, Auto-Refresh is activated by programming the data into another block before the data is corrupted. After the re-programming operation is completed, the controller reads the data and compares the data/parity to ensure data integrity.

Owing to different user experiences, please contact ATP for Auto-Refresh in real applications.

3.0 Mechanical Dimension & SATA SSD Pin Assignment

3.1 Mechanical Form Factor (Units in mm)

Table 3.1: Mechanical Dimension

Type		Value
M.2 2280-D2-B-M	Length	80 mm +/- 0.15
	Width	22 mm +/- 0.15
	Thickness	3.35mm (MAX)
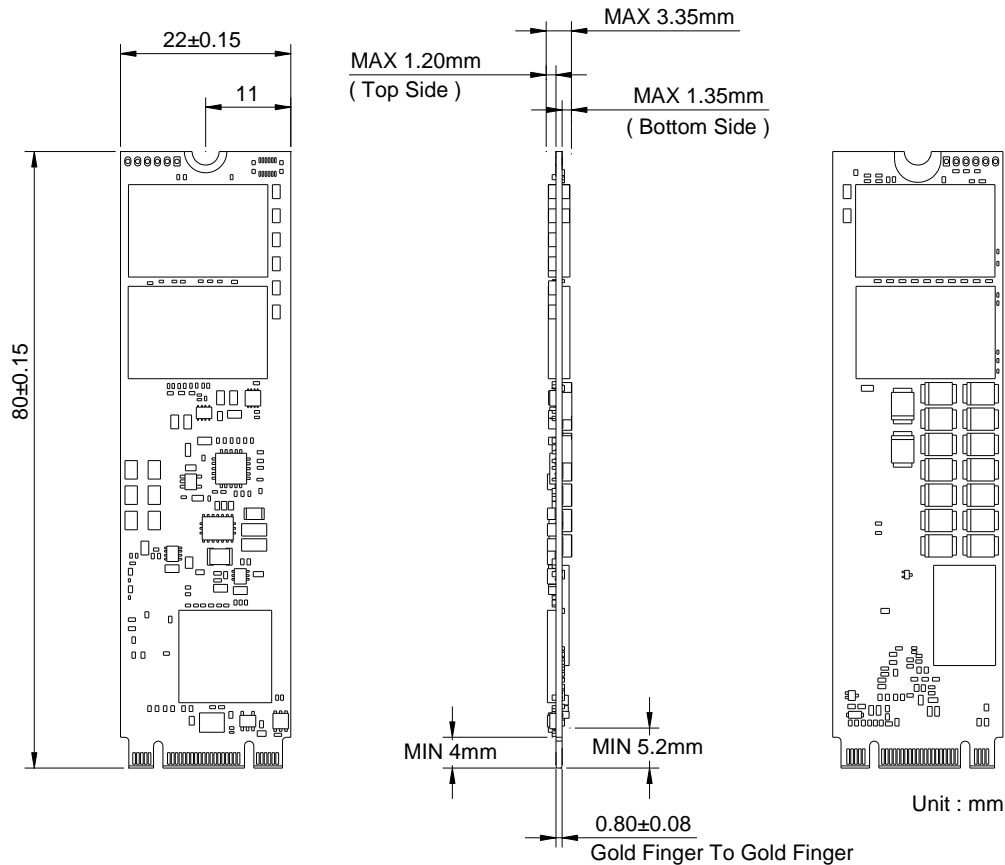
3.2 Pin Location

The following figure shows the pin location of the M.2 Embedded SSD, the golden finger is with both signal and power segments.

Figure 3-2
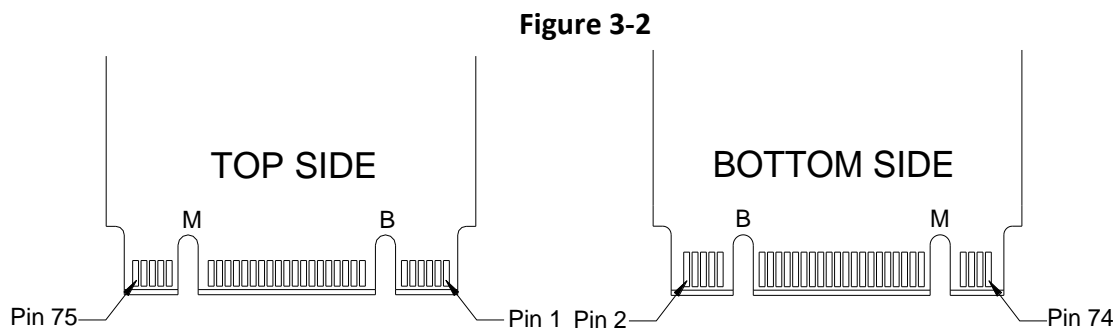
3.3 Pin Assignment

There are total of 75 pins and the pin definitions are shown in Table 3-3-1

Table 3-3-1

Pin#	Function	Description	Pin#	Function	Description
1	CONFIG_3	Ground	2	3.3V	3.3 V Source
3	GND	Ground	4	3.3V	3.3 V Source
5	N/C	No Connect	6	N/C	No Connect
7	N/C	No Connect	8	N/C	No Connect
9	N/C	No Connect	10	DAS/DSS# (I/O)	Device Activity Signal / Disable Staggered Spin-up
11	N/C	No Connect	Module Key		
Module Key			20	N/C	No Connect
21	CONFIG_0	Ground	22	N/C	No Connect
23	N/C	No Connect	24	N/C	No Connect
25	N/C	No Connect	26	N/C	No Connect
27	GND	Ground	28	N/C	No Connect
29	N/C	No Connect	30	N/C	No Connect
31	N/C	No Connect	32	N/C	No Connect
33	GND	Ground	34	N/C	No Connect
35	N/C	No Connect	36	N/C	No Connect
37	N/C	No Connect	38	DEVSLP	Enter/Exit DevSleep
39	GND	Ground	40	N/C	No Connect
41	SATA-B+	Host Receiver Differential Signal Pair	42	N/C	No Connect
43	SATA-B-	Host Receiver Differential Signal Pair	44	N/C	No Connect
45	GND	Ground	46	N/C	No Connect
47	SATA-A-	Host Transmitter Differential Signal Pair	48	N/C	No Connect
49	SATA-A+	Host Transmitter Differential Signal Pair	50	N/C	No Connect
51	GND	Ground	52	N/C	No Connect
53	N/C	No Connect	54	N/C	No Connect
55	N/C	No Connect	56	Reserved for MFG_DATA	No Connect
57	GND	Ground	58	Reserved for MFG_CLOCK	No Connect

Pin#	Function	Description	Pin#	Function	Description
Module Key			Module Key		
67	N/C	No Connect	68	N/C	No Connect
69	CONFIG_1	Ground	70	3.3V	3.3 V Source
71	GND	Ground	72	3.3V	3.3 V Source
73	GND	Ground	74	3.3V	3.3 V Source
75	CONFIG_2	Ground			

4.0 Command Set

4.1 ATA Command Set

ATP SATAIII SSD supports the commands show in the following table:

Table 4-1

Command Code	Command	Protocol
00h	NOP	Non-Data
06h	DATA SET MANAGEMENT	DMA
20h	READ SECTOR(S)	PIO Data -in
24h	READ SECTOR(S) EXT	PIO Data -in
25h	READ DMA EXT	DMA
29h	READ MULTIPLE EXT	PIO Data -in
2Fh	READ LOG EXT	PIO Data -in
30h	WRITE SECTOR(S)	PIO Data-Out
34h	WRITE SECTOR(S) EXT	PIO Data-Out
35h	WRITE DMA EXT	DMA
39h	WRITE MULTIPLE EXT	PIO Data-Out
3Dh	WRITE DMA FUA EXT	DMA
3Fh	WRITE LOG EXT	PIO Data-Out
40h	READ VERIFY SECTOR(S)	Non-Data
42h	READ VERIFY SECTOR(S) EXT	Non-Data
45h	WRITE UNCORRECTABLE EXT	Non-Data
47h	READ LOG DMA EXT	DMA
57h	WRITE LOG DMA EXT	DMA
5Bh	TRUSTED NON-DATA	Non-Data
5Ch	TRUSTED RECEIVE	PIO Data -in
5Dh	TRUSTED RECEIVE DMA	DMA
5Eh	TRUSTED SEND	PIO Data-Out
5Fh	TRUSTED SEND DMA	DMA
60h	READ FPDMA QUEUED	DMQ
61h	WRITE FPDMA QUEUED	DMQ
77h	SET DATE & TIME EXT	Non-Data
78h	ACCESSIBLE MAX ADDRESS CONFIGURATION	Non-Data
90h	EXECUTE DEVICE DIAGNOSTIC	EXECUTE DEVICE
92h	DOWNLOAD MICROCODE	PIO Data-Out
93h	DOWNLOAD MICROCODE DMA	DMA
B0h	SMART	Non-Data
B0h/D0h	SMART READ DATA	PIO Data -in

Command Code	Command	Protocol
B0h/D2h	SMART ENABLE/DISABLE AUTOSAVE	Non-Data
B0h/D4h	SMART EXECUTE OFF_LINE IMMEDIATE	Non-Data
B0h/D5h	SMART READ LOG	PIO Data -in
B0h/D6h	SMART WRITE LOG	PIO Data-Out
B0h/D8h	SMART ENABLE OPERATIONS	Non-Data
B0h/D9h	SMART DISABLE OPERATIONS	Non-Data
B0h/DAh	SMART RETURN STATUS	Non-Data
B4h	Sanitize Device	Non-Data
C4h	READ MULTIPLE	PIO Data -in
C5h	WRITE MULTIPLE	PIO Data-Out
C6h	SET MULTIPLE MODE	Non-Data
C8h	READ DMA	DMA
CAh	WRITE DMA	DMA
CEh	WRITE MULTIPLE FUA EXT	PIO Data-Out
E0h	STANDBY IMMEDIATE	Non-Data
E1h	IDLE IMMEDIATE	Non-Data
E2h	STANDBY	Non-Data
E3h	IDLE	Non-Data
E4h	READ BUFFER	PIO Data -in
E5h	CHECK POWER MODE	Non-Data
E6h	SLEEP	Non-Data
E7h	FLUSH CACHE	Non-Data
E8h	WRITE BUFFER	PIO Data-Out
E9h	READ BUFFER DMA	DMA
EAh	FLUSH CACHE EXT	Non-Data
EBh	WRITE BUFFER DMA	DMA
ECh	IDENTIFY DEVICE	PIO Data -in
EFh	SET FEATURES	Non-Data
F1h	SECURITY SET PASSWORD	PIO Data-Out
F2h	SECURITY UNLOCK	PIO Data-Out
F3h	SECURITY ERASE PREPARE	Non-Data
F4h	SECURITY ERASE UNIT	PIO Data-Out
F5h	SECURITY FREEZE LOCK	Non-Data
F6h	SECURITY DISABLE PASSWORD	PIO Data-Out

4.2 Identity Device Data

Word Address	Default Value	Data Field Type Information
0	0040h	General configuration
1	3FFFh	Obsolete
2	C837h	Specific configuration
3	0010h	Obsolete
4-5	0000h	Retired
6	003Fh	Obsolete
7-8	0000h	Reserved for assignment by the CompactFlash Association
9	0000h	Retired
10-19	Varies	Serial number in ASCII
20	0000h	Retired
21	0000h	Retired
22	0000h	Obsolete
23-26	Varies	Firmware revision in ASCII
27-46	Varies	Model Name in ASCII
47	8010h	READ/WRITE MULTIPLE support
48	4000h	Trusted Computing feature set options
49	2F00h	Capabilities
50	4001h	Capabilities
51	0000h	Obsolete
52	0000h	Obsolete
53	0006h	Field validity
54	Varies	Current Cylinders
55	Varies	Current Heads
56	Varies	Current Sector Per Track
57-58	Varies	Current Capacity
59	9D10h	Multiple sector setting
60-61	Varies	Total number of user addressable logical sectors for 28-bit commands (DWord)
62	0000h	Obsolete
63	0207h	Multiword DMA transfer Support MDMA Mode 0, 1, and 2
64	0003h	PIO transfer modes supported
65	0078h	Minimum Multiword DMA transfer cycle time per word
66	0078h	Device recommended Multiword DMA cycle time
67	0078h	Minimum PIO transfer cycle time without IORDY flow control
68	0078h	Minimum PIO transfer cycle time with IORDY flow control
69	4D28h	Additional Supported

Word Address	Default Value	Data Field Type Information
		Extended Number of User Addressable Sectors is supported
		Trimmed LBA range(s) returning zeroed data is supported
		Optional ATA device 28-bit commands supported
		Download Microcode DMA is supported
		Write Buffer DMA is supported
		Read Buffer DMA is supported
		Deterministic read after TRIM is supported
70-74	0000h	Reserved
75	001Fh	Queue depth
76	870Eh	Serial ATA capabilities
		Support Serial ATA Gen1 signaling speed (1.5 Gbps)
		Support Serial ATA Gen2 signaling speed (3.0 Gbps)
		Support Serial ATA Gen3 signaling speed (6.0 Gbps)
		Support NCQ(Native Command Queuing)
		Support receipt of host-initiated interface power
		Support Phy event counters
		Support READ LOG DMA EXT as equivalent to READ LOG EXT
77	0006h	Serial ATA Additional capabilities
78	014Ch	Serial ATA features supported
		Support DMA Setup Auto-Activate optimization
		Device supports initiating interface power management
		Support software settings preservation
		Device Sleep supported
79	0040h	Serial ATA features enabled
		Software settings preservation enabled
80	07F0h	Major revision number
81	006Dh	Minor version number
82	706Bh	Features/command sets supported 0
		Support SMART Feature Set
		Support Security Mode Feature Set
		Support Power management feature set
		Support Write Cache
		Support Look-Ahead
		Support WRITE BUFFER command
		Support READ BUFFER command
		Support NOP command
83	7409h	Features/command sets supported 1
		Support DOWNLOAD MICROCODE Command

15

Word Address	Default Value	Data Field Type Information
		Support Advanced Power Management Feature Set
		48-bit Address feature set supported
		Support FLUSH CACHE command
		Support FLUSH CACHE EXT command
84	4163h	Command Sets Support 2 Support SMART error logging Support SMART self-test The GPL feature set is supported WRITE DMA FUA EXT and WRITE MULTIPLE FUA EXT commands are supported The 64-bit World Wide Name is supported
85	7069h	Features/command sets enabled 0 SMART feature set is enabled Power Management feature set is supported Volatile write cache is enabled Read look-ahead is enabled WRITE BUFFER command is supported READ BUFFER command is supported NOP command is supported
86	B409h	Features/command sets enabled 1 Supported DOWNLOAD MICROCODE Command Enable Advanced Power Management Feature Set 48-bit Address feature set Supported Support FLUSH CACHE command Support FLUSH CACHE EXT command
87	4163h	Features/command sets enabled 2 Support SMART error logging Support SMART self-test The GPL feature set is supported WRITE DMA FUA EXT and WRITE MULTIPLE FUA EXT commands are supported The 64-bit World Wide Name is supported
88	007Fh	Ultra DMA modes True IDE UDMA mode 0 is supported True IDE UDMA mode 1 and below are supported True IDE UDMA mode 2 and below are supported True IDE UDMA mode 3 and below are supported True IDE UDMA mode 4 and below are supported True IDE UDMA mode 5 and below are supported

16

Word Address	Default Value	Data Field Type Information
		True IDE UDMA mode 6 and below are supported
89	0001h	Time required for Security erase unit completion
90	0001h	Time required for Enhanced security erase unit completion
91	00FEh	Advanced power management level value
92	FFFEh	Master Password Revision Code
93	0000h	Hardware configuration test results
94	0000h	Current automatic acoustic management value
95	0000h	Stream Minimum Request Size
96	0000h	Streaming Transfer Time -- DMA
97	0000h	Streaming Access Latency - DMA and PIO
98-99	0000h	Streaming Performance Granularity
100-103	Varies	Maximum user LBA for 48-bit Address feature set
104	0000h	Streaming Transfer Time - PIO
105	0008h	Maximum number of 512-byte blocks per DATA SET MANAGEMENT command
106	4000h	Physical sector size / Logical Sector Size
107	0000h	Inter-seek delay for ISO 7779 standard acoustic testing
108-111	Varies	Worldwide name
112-115	0000h	Reserved for a 128-bit worldwide name
116	0000h	Reserved for technical report
117-118	0000h	Logical Sector Size
119-126	0000h	Reserved
127	0000h	Removable Media Status Notification feature set support
128	0021h	Security Status Security Supported Security is disabled Enhanced security erase supported
129-159	Varies	Vendor specific
160	0000h	CFA Power mode
161	0000h	CFast Specific Support
162	0000h	Key Management Schemes Supported
163	0000h	CF Advanced True IDE Timing Mode Capabilities and Settings
164-168	0000h	Reserved
169	0001h	Data Set Management is Supported Trim is supported
170-175	0000h	Reserved
176-205	0000h	Current media serial number
206	0035h	SCT Command Transport

Word Address	Default Value	Data Field Type Information
		The SCT Command Transport is supported
		The SCT Write Same Command is supported
		The SCT Feature Control Command is supported
		The SCT Data Tables Command is supported
207-216	Varies	Reserved
217	0001h	Nominal media rotation rate Non-rotating media (SSD)
218-221	0000h	Reserved
222	11FFh	Transport Major Version Number Transport Type: Serial ATA8-AST SATA 1.0a SATA II: Extensions SATA Rev 2.5 SATA Rev 2.6 SATA Rev 3.0 SATA Rev 3.1
223-233	0000h	Reserved
234	0001h	Min number of 512-byte data blocks per Download Microcode operation
235	0200h	Max number of 512-byte data blocks per Download Microcode operation
236-254	0000h	Reserved
255	Varies	Integrity word (Checksum: 0x01 Signature: A5)
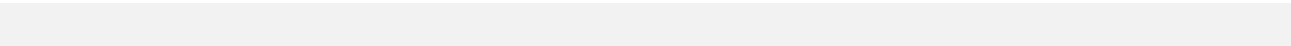
4.3 Smart Information

ATP SATAIII SSD supports S.M.A.R.T. ATA feature set in IDE mode, AHCI mode.

4.3.1. Smart Subcommand Sets

In order to select a subcommand, the host must write the subcommand code to the device's Features Register before issuing the SMART Function Set command. The subcommands are listed below.

Table 4-3-1

Command Code	Command
D0h	SMART Read Data
D1h	SMART Read Attribute Thresholds
D2h	SMART Enable/Disable Attribute Autosave
D3h	SMART Save Attribute Values
D4h	SMART Execute Off-Line Immediate
D5h	Read Log
D6h	Write Log
D8h	SMART Enable Operations
D9h	SMART Disable Operations
DAh	SMART Return Status

Note: If the reserved size is below a threshold, status can be read from the Cylinder Register using the Return Status command (DAh)

4.3.2. SMART Attribute

The following table defines the vendor specific data in byte 2 to 361 of the 512-byte SMART data.

Table 4-3-2

ID	Value (hex)	Attribute Name
1	01	Raw Read Error Count (0x01)
5	05	Reallocated Flash Blocks Count
9	09	Power On Hours (0x09)
12	0C	Normal Power On/Off count
14	0E	Device Physical Capacity (0x0E)
15	0F	Device User Capacity (0x0F)
16	10	Initial Spare blocks (0x10)
17	11	Remaining Spare Blocks at Current Time (0x11)
100	64	Total Erase Count
160	A0	Uncorrectable Sector Count When Read/Write
172	AC	Total Block Erase Failure (0xAC)
173	AD	Maximum Erase Count (0xAD)
174	AE	Unexpected Power Loss Count
175	AF	Average Erase Count
181	B5	Total Block Program Failure

ID	Value (hex)	Attribute Name
187	BB	Reported Uncorrectable Errors (0xBB)
194	C2	Device Temperature (0xC2)
195	C3	Hardware ECC Recovered
197	C5	Current Pending Block Count (0xC5)
198	C6	Offline Surface Scan (0xC6)
199	C7	SATA FIS CRC Errors
202	CA	Percentage of Drive Life Used
205	CD	Thermal Asperity Rate (TAR)
231	E7	Controller Temperature
234	EA	Total Sectors Read from NAND Flash
235	EB	Total Sectors Written to Device
241	F1	Total NAND Sectors Written to NAND Flash
242	F2	Total Sectors Read from Device
248	F8	Remaining Life %
249	F9	Spare Block Remaining

4.4   SMART Command Transport

Action Code (hex)	Description
0003h	Error recovery control
0004h	Features control
0005h	SCT data tables

4.5   Set Features

Feature code (hex)	Description
02	Enable write cache
66	Disable reverting to Power-On defaults
82	Disable write cache
CC	Enable reverting to Power-On defaults

5.0 Part Number Decoder

Standard Part Number

AF | 960G | ST | IC | - | 7BE | X | P

ATP Flash product

User capacity

Product Type
SS: SLC
SA: pSLC
ST: TLC
SM: MLC

Interface
SATA series
CJ: 2.5" SSD
IC: M.2 2280
IA: M.2 2242
HI: mSATA
NVMe series
JA: M.2 2280
JB: M.2 2230

Product version

Temperature
I : -40˚C~+85˚C
X : 0˚C~+70˚C

PLP feature
P : HW PLP
X : FW PLP

(Only for reference)

OEM Part Number

AF | 960G | ST | IC | - | XX | 1

ATP Flash product

User capacity

Product Type
SS: SLC
SA: pSLC
ST: TLC
SM: MLC

Interface
SATA series
CJ: 2.5" SSD
IC: M.2 2280
IA: M.2 2242
HI: mSATA
NVMe series
JA: M.2 2280
JB: M.2 2230

Customer code

Version

(Only for reference)

6.0 Certification and Declarations

Certification	Mark	Description
CE compliant	CE	The CE marking (also known as CE mark) is a mandatory conformance mark on many products placed on the single market in the European Economic Area (EEA). The CE marking certifies that a product has met EU consumer safety, health or environmental requirements. CE stands for Conformité Européenne, "European conformity" in French.
UKCA	UKCA	The UKCA (UK Conformity Assessed) marking is a new UK product mark for the products that conforms to the CE marking and sold in Great Britain, which is effective from 1st of January 2021.
FCC	FC	FCC Part 15 Class B was used for Evolution of United States (US) Emission Standards for Commercial Electronic Products, The United States (US) covers all types of unintentional radiators under Subparts A and B (Sections 15.1 through 15.199) of FCC 47 CFR Part 15, usually called just FCC Part 15
BSMI compliant		BSMI logo signifies the product is compliant with Taiwan EMC standard for CNS13438.
RoHS	-	Compliant with the Restriction of Hazardous Substances (RoHS) Directive (2011/65/EU)
REACH	-	Compliant with REACH (Registration, Evaluation, Authorization and Restriction of Chemicals which is an EU Regulation that came into force on 1 June 2007

www.atpinc.com

X-ON Electronics

Largest Supplier of Electrical and Electronic Components

Click to view similar products for Solid State Drives - SSD *category:*

Click to view products by ATP Electronics *manufacturer:*

Other Similar products are found below :

MTFDDAC512MAM-1K1 ASD25-MLC064G-CT-160-1 SQF-SM4V2-256G-SBC MTFDDAA120MBB-2AE1ZABYY MTFDDAA240MBB-2AE1ZABYY SQF-S25V4-240G-SCC SQF-SDMM2-256G-S9E MTFDKBA400TFS-1BC1ZABYY MTFDKBZ3T8TFR-1BC1ZABYY MTFDKBA800TFS-1BC1ZABYY SQF-SMSZ2-64GCSBC B92.225HGV.00205 APM128GMFFN-6BTM1GW MTFDDAK060MBD-1AH12ITYY MTFDDAK960MBP-1AN16ABYY VSF202PC016G-100 AF512GSMEL-VABIP FFD-25-SATA-1-A 2400022 2913199 2701112 MTFDDAV512TBN-1AR1ZABYY SSDPEKKA256G801 2400338 2400335 MTFDDAV256TBN-1AR12ABYY SSDPEKKA020T801 MTFDDAK064MBD-1AH12ITYY MTFDDAK800MBP-1AN1ZABYY EP-SSMSF128AACS SQF-S25U8-128G-SAE A52.255LHB.00246 AP-FD25C23E0064GS-5TM AP-FD25C23E0128GS-W5TM AP-FM008GD2505S-TW1M AP-FM008GD2505S-T1H APM256GMFFN-4BTM1GW APM2T42SM22032GFN-4FTM APM2T80SM21256GAS-4BTMG APS297F064G-4BTM1GF APM016GNEAN-4ETM1 AF8GSSHI-VACXP AF32GSMEL-VAEIP AF256GSMEL-VABIP AF16GSSIA-VAAXP AF32GSSHI-VACXP AF240GSTIC-7BEXP AF480GSTJA-8BEIX GLS86FP512G3-I-BZ000 GLS87BP001T3-C-BZ200