# powersafe™

# swissbit®

**Product Data Sheet** 

Industrial M.2 PCIe SSD

N3602 Series
PCle 4.0, 3D pSLC

Industrial Temperature Grade

Date: October 17, 2024 Revision: 1.00





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# N3602 Series - Industrial M.2 PCIe SSD 80 GBytes up to 320 GBytes

## 1. Product Summary

- Capacities: 80 GBytes, 160 GBytes, 320 GBytes
- Form Factor: PCI Express M.2 2280 (80 mm x 22 mm x 3.8 mm)
- Compliance<sup>1</sup>: PCI Express (PCIe) Base Specification Revision 4.0
- Interface: Gen4 x 4 Lanes
  - Drive operates in x1 mode in x1 M.2 PCle slots
  - o Drive operates in x2 mode in x2 M.2 PCle slots
  - o Drive operates in x4 mode in x4 M.2 PCle slots
- Command Sets: Supports NVMe 1.4
- Target Performance:
  - Read Performance: Sequential Read up to 3,850 MBytes/s, Random Read 4K up to 392,800 IOPS Write Performance: Sequential Write up to 3,350 MBytes/s, Random Write 4K up to 515,900 IOPS
- Operating Temperature Range<sup>2</sup>:
  - Industrial: -40 °C to 85 °C
- Storage Temperature Range: -40 °C to 85 °C
- Power:
  - Power States PSo, PS1, PS2, PS3 and PS4
  - Thermal Throttling supported
- Data Retention<sup>3</sup>: 10 Years @ Life Begin; 1 Year @ Life End, @40 °C
- Shock/Vibration: 1,500 g / 50 g
- High-Performance Processor with Integrated, Parallel Flash Interface Engines:
  - Triple-Level Cell (TLC) 3D NAND Flash in pSLC mode
  - DDR4 DRAM based Controller architecture
  - 240 bit LDPC correction per 2 KByte
- High Reliability:
  - Mean Time Between Failure (MTBF): > 3,000,000 hours
  - o Data Reliability: < 1 non-recoverable error per 10<sup>16</sup> bits read

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<sup>&</sup>lt;sup>1</sup> To check the compatibility of the customer system and the storage device is part of the customer's responsibility. Swissbit can provide guidance and support on request.

<sup>&</sup>lt;sup>2</sup> Adequate airflow is required to ensure the temperature, as reported in the S.M.A.R.T. data, does not exceed 105 °C (industrial temperature drive).

<sup>&</sup>lt;sup>3</sup> NAND Flash suppliers refer to JEDEC JESD47 and JESD22 for Data Retention testing. Based on the information provided by the NAND Flash suppliers, Data Retention is targeted as shown



#### 2. Product Features

- Diagnostic features
- Life end read only mode
- RAID engine
- Drive self-test
- Data Care Management
  - o Active: Adaptive Read Refresh
  - Passive: Background Media Scan
- Active State Power Management (ASPM) Support
- In-Field Firmware Update<sup>4</sup>
- **Adaptive Thermal control**
- DRAM-Buffer
- Self-Monitoring, Analysis, and Reporting Technology (S.M.A.R.T., Telemetry)
- SMBus<sup>5</sup> (NVMe Management Interface Basic Management Command, NVMe-MI v1.2)
- 30 µinch (0.8 µm) Gold-Plated Connector (IPC-6012C Class 2 Compliant)
- End-to-End (E2E) Data Protection
- powersafe™ Functionality (Power Loss Protection Level 3)
- Controlled "Locked" BOM
- RoHS / REACH Compliant
- Swissbit Device Manager Tool (SBDM)

## 3. Security features

- AES256 encryption
- TCG OPAL 2.0
- Secure Boot
- Crypto erase
- IEEE 1667





























<sup>&</sup>lt;sup>4</sup> The support of In-Field FW update capabilities on host systems is recommended.

<sup>&</sup>lt;sup>5</sup> SMBus commands are only processed in operational power states.



# 4. Ordering Information

#### Table 1: Standard Product List

Capacity	Part Number	Numbers of Lanes
80 GBytes	SN3602Mx080GI-yMA4-zGA-STD	
160 GBytes	SN3602Mx160GI-yMA2-zGA-STD	4
320 GBytes	SN3602Mx320GI-yMA4-zGA-STD	

x = Form Factor; y = Product Generation; z= Firmware Revision

#### Table 2: Available Part Numbers

Capacity	Industrial Temperature
Capacity	2280 PowerSafe
80 GBytes	SN3602MD080GI-1MA4-1GA-STD
160 GBytes	SN3602MD160GI-1MA2-1GA-STD
320 GBytes	SN3602MD320GI-1MA4-1GA-STD



## 5. Product Description

The Swissbit® N3602 Solid State Drive (SSD) leverages the M.2 standard and NVMe standard to support a PCIe electrical interface as well as AES encryption, E2E data protection and TCG Opal standards. The NVMe controller and the newest 3D NAND flash technology provides robust, non-volatile storage solution for today's embedded computing applications. A functional block diagram of the N3602 SSD is provided below in Figure 1.

NAND Flash NAND Flash PCle PCIe Lanes 4 Controller Host NAND Flash NAND

Figure 1: N3602 Functional Block Diagram

The N3602 SSD incorporates a 75-position edge connector with M key to support host read/write, control, and power activity per the applicable JEDEC specification.

Power

Manager

Flash

DRAM

Cache

The on-board NVMe controller manages the interface between the host and the non-volatile NAND flash memory array. The controller is designed to support PCIe interface speeds and utilizes a dual processing core, providing an optimum balance between read/write performance, Data Care Management, and power fail protection.

Swissbit's N3602 SSDs deliver an impressive IOPS rate and highest endurance by combining 3D NAND flash technology with a high-end controller architecture, firmware, and an optimized configuration. The SSDs are designed for applications requiring high data transfer rates (see Table 3: Read/Write Performance). This performance is achieved through a 4-channel flash controller and 4-lane PCle interface.

An on-controller LDPC Error Correction Code (ECC) engine provides the N3602 hardware ECC, which is capable of correcting up to 240 bits per 2 KByte page. This engine, combined with Swissbit's Data Care Management firmware, provides both passive and active data management strategies to ensure data integrity and extract the maximum possible endurance and reliability from the NAND flash array. These strategies include, but are not limited to, Global Wear Leveling, Adaptive Read Refresh, and Dynamic Block Remapping.

#### **Related Documentation**

- NVM Express Revision 1.4, (https://nvmexpress.org/)
- PCI Express M.2 Standard PCI Express M.2 Specification, Revision 3.0, June 26, 2019 (https://pcisig.com)



#### **5.1 Performance Specifications**

The N3602 read/write sequential and random CDM performance benchmarks are detailed in Table 3.

#### Table 3: Read/Write Performance<sup>6</sup>

Capacity	Sequential Read (MBPS)	Sequential Write (MBPS)	Random Read 4k (IOPS)	Random Write 4k (IOPS)
80 GBytes	3,650	1,480	108,200	360,900
160 GBytes	3,790	2,940	210,600	511,200
320 GBytes	3,850	3,350	392,800	515,900

#### 5.2 Current Consumption

The drive-level current consumption as a function of operating mode is shown in Table 4.

#### Table 4: Current Consumption7, 8, 9

Capacity	Sequential Read	Sequential Write	Random Read 4k	Random Write 4k	Idle <sup>10</sup>	PS3 <sup>10</sup>	PS4 <sup>10</sup>	Unit
80 GBytes	1,130	880	710	880		54 15	2	mA
160 GBytes	1,160	1,180	840	1,020	54			
320 GBytes	1,190	1,310	1,080	1,050				

The values are measured using Crystal Disk Mark 8. Performance depends on flash type and number, file/cluster size, and burst speed.
 All values are measured at 25 °C and 3.3V power supply.
 Active values measured during burst workload using fio with QD=8 and threads=1 for 128kiB sequential read/write and QD=32 and threads=16 for 4kiB random read/write with file size = 1GiB.

<sup>9</sup> Active and idle based on highest averaged current peak over a 1s-window with a sample rate of 25okS/s.

<sup>&</sup>lt;sup>10</sup> Measured with enabled ASPM L1.2.



#### **5.3 Environmental Specifications**

#### 5.3.1 Recommended Operating Conditions

The recommended operating conditions for the N3602 SSD are provided in Table 5.

Table 5: Recommended Operating Conditions<sup>11</sup>

Parameter	Value		
Industrial Operating Temperature	−40 °C to 85 °C		
Power Supply V <sub>CC</sub> Voltage	3.3 V ± 5%		

#### 5.3.2 Recommended Storage Conditions

The recommended storage conditions are listed in Table 6.

**Table 6: Recommended Storage Conditions** 

Parameter	Value		
Industrial Storage Temperature	−40 °C to 85 °C		

#### 5.3.3 Shock, Vibration and Humidity

The maximum shock, vibration and humidity conditions are listed in Table 7.

Table 7: Shock Vibration and Humidity

Table 7. Shock, Vibration and Humarty			
Parameter	Value		
Non-Operating Shock	1,500 g, 0.5 ms pulse duration, half-sine wave (IEC 60068-2-27 and JESD22-B110 cond. B)		
Non-Operating Vibration	50 <i>g</i> , 80-2,000 Hz, 3 axes, 12 cycles (IEC 60068-2-6, MIL-STD-883 H Method 2007.3)		
Humidity (Non-Condensing)	85% RH 85 °C, 1000 hrs, max. supply voltage (JESD22-A101B)		

Adequate airflow is required to ensure the temperature, as reported in the S.M.A.R.T. data, does not exceed 105 °C (industrial temperature drive).





### 5.4 Regulatory Compliance

The N<sub>3</sub>602 devices comply with the regulations / standards listed in Table 8.

**Table 8: Regulatory Compliance** 

Abbreviation	Regulation/ Standard
EMC	CE - 2014/30/EU FCC - 47 CFR Part 15 UKCA - S.I. 2016 No. 1091 and S.I. 2012 No. 3032
RoHS	2011/65/EU with 2015/863/EU and 2017/2102/EU
REACh	1907/2006/EU and 207/2011/EU
WEEE	2012/19/EU

### 5.5 Mechanical Specifications

Physical dimensions are detailed in Table 9. Figure 3 on page 13 illustrates the N3602 dimensions.

**Table 9: Physical Dimensions** 

Physical Dimensions		
Length	80.00±0.15	
Width	22.00±0.15	mm
Thickness (nominal)	3.8	
Weight (Max Capacity)	≤ 9.0	g



#### 5.6 Reliability and Endurance

The Mean Time Between Failure (MTBF) is specified to exceed the value listed in Table 10. Data reliability with effective error tolerance and data retention at the beginning and end of life is also provided.

Table 10: Reliability

Parameter	Value		
MTBF (at 25 °C)	> 3,000,000 hours		
Data Reliability	< 1 Non-Recoverable Error per 10 <sup>16</sup> Bits Read		
Data Retention	10 Years at Start (JESD47), 1 Year at EOL		

Endurance represented as both TeraBytes Written (TBW) and full Drive Writes Per Day (DWPD) for different application scenarios is provided in Table 11.

Table 11: Endurance12, 13

Capacity	Sequ	ential	Client		Enterprise	
Capacity	TBW	DWPD <sup>14</sup>	TBW	DWPD <sup>14</sup>	TBW	DWPD <sup>14</sup>
80 GBytes	5,660	64.6	2,910	33.2	1,300	14.8
160 GBytes	11,050	63.0	5,760	32.8	2,200	12.6
320 GBytes	22,190	63.3	11,670	33.3	4,790	13.7

#### 5.7 Drive Geometry Specification

The N3602 drive geometry is set to report industry standard LBA settings per the IDEMA standard (LBA1-03). The values for each capacity are shown in Table 12.

Table 12: Drive Geometry

Paw Canacity	Uson Canacitu 15	Total LBA	User Addressable Bytes	
Raw Capacity	User Capacity <sup>15</sup>	Decimal	(Unformatted)	
256 GBytes	80 GBytes	156,301,488	80,026,361,856	
512 GBytes	160 GBytes	312,581,808	160,041,885,696	
1024 GBytes	320 GBytes	625,142,448	320,072,933,376	

<sup>&</sup>lt;sup>12</sup> Client and Enterprise workloads follow the JEDEC JESD219 standard. Enterprise workload values are measured based on 168 hours of runtime. 1 TByte = 10<sup>12</sup> bytes

According to JEDEC (JESD471), the time to write the full TBW is a minimum of 18 months. Higher average daily data volume reduces the specified TBW. The values listed are estimates and are subject to change without notice.

<sup>&</sup>lt;sup>14</sup> DWPD values are based on a service life of 3 years

<sup>&</sup>lt;sup>15</sup> 1 GByte = 10<sup>9</sup> bytes



## 6. Electrical Interface

This 75-position m.2 connector (Figure 2) incorporates M key for Socket 3 PCle-based SSDs and follows the applicable PCle m.2 specification. The signal/pin assignments and descriptions are listed in the following Table 13.

Figure 2: N3602 Electrical Interface

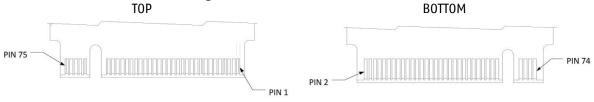


Table 13: Pin Assignment, Name and Description

Description	Assignment	Pin	Pin	Assignment	Description
Config_3	GND	1	2	+3.3V	3.3V Source
Ground	GND	3	4	+3.3V	3.3V Source
PCIe TX Differential Signal	PETn3*	5	6	NC	No Connect
PCIe TX Differential Signal	PETp3*	7	8	NC	No Connect
Ground	GND	9	10	DAS/DSS	DEVACT Device Activity Signal
PCIe RX Differential Signal	PERn3*	11	12	+3.3V	3.3V Source
PCIe RX Differential Signal	PERp3*	13	14	+3.3V	3.3V Source
Ground	GND	15	16	+3.3V	3.3V Source
PCIe TX Differential Signal	PETn2*	17	18	+3.3V	3.3V Source
PCIe TX Differential Signal	PETp2*	19	20	NC	No Connect
Config_o	GND	21	22	NC	No Connect
PCIe RX Differential Signal	PERn2*	23	24	NC	No Connect
PCIe RX Differential Signal	PERp2*	25	26	NC	No Connect
Ground	GND	27	28	NC	No Connect
PCIe TX Differential Signal	PETn1*	29	30	NC	No Connect
PCIe TX Differential Signal	PETp1*	31	32	NC	No Connect
Ground	GND	33	34	NC	No Connect
PCIe RX Differential Signal	PERn1*	35	36	NC	No Connect
PCIe RX Differential Signal	PERp1*	37	38	NC	No Connect
Ground	GND	39	40	SMB_CLK	SMBus Clock
PCIe TX Differential Signal	PETno*	41	42	SMB_DATA	SMBus Data
PCIe TX Differential Signal	PETpo*	43	44	ALERT#	SMBus Alert Notification
Ground	GND	45	46	NC	No Connect
PCIe RX Differential Signal	PERno*	47	48	NC	No Connect
PCIe RX Differential Signal	PERpo*	49	50	PERST#	PE-Reset (Functional Reset)
Ground	GND	51	52	CLKREQ#	Clock Request Signal; L1 PM
PCIe Reference Clock Signal	REFCLKn	53	54	NC	PCIe PME Wake
PCIe Reference Clock Signal	REFCLKp	55	56	NC	MFG Data
Ground	GND	57	58	NC	MFG Clock



Mechanical Notch M –		59-65	60-66	_	Mechanical Notch M
No Connect	NC	67	00-00	-	Mechanical Notell M
Config_1	NC	69	68	NC	32.768 kHz Clock Supply
Ground	GND	71	70	3.3V	Supply Pin, 3.3V
Ground	GND	73	72	3.3V	Supply Pin, 3.3V
Config_2	GND	75	74	3.3V	Supply Pin, 3.3V

<sup>\*</sup>TX (transmit) and RX (receive) pins are labeled from the SSD view and must be connected with the reversed RX and TX signals of the host (i.e., TX to RX and RX to TX).



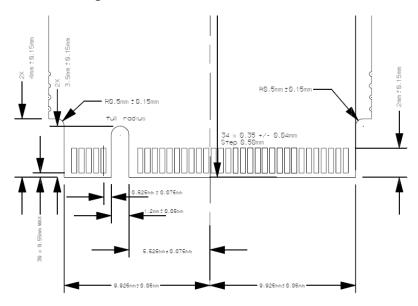
# 7. Package Mechanical

-22±0.15-MECHANICAL **MECHANICAL** -(11)-**−**1.75 MAX **GROUND PAD GROUND PAD** 0.8 (+/- 10%) воттом TOP SIDE TOP SIDE SIDE COMPONENT/ 80±0.15 4 MIN **TOP VIEW BOTTOM VIEW** 

Figure 3: N3602 2280 dimensions in mm



Figure 4: M.2 Connector Dimensions in mm



### 8. NVMe Commands

This section provides information on the NVMe commands supported by the SSD. The commands are issued by loading the DWords in the command block with the supplied parameter, and then writing the command code to the register. See the following Table 14 for a list of NVMe commands the device supports. For details about setting up the command registers, see the latest NVMe Specification.

Table 14: NVMe Command Set - Supported Commands

Command	Code			
Admin Command Set				
Delete I/O Submission Queue	ooh			
Create I/O Submission Queue	o1h			
Get Log Page	o2h			
Delete I/O Completion Queue	o4h			
Create I/O Completion Queue	05h			
Identify	o6h			
Abort	o8h			
Set Features	o9h			
Get Features	oAh			
Asynchronous Event Request	oCh			
Firmware Commit	10h			
Firmware Image Download	11h			
Device Self-test	14h			
Format NVM	8oh			
Sanitize	84h			
NVM Command Set				
Flush	ooh			
Write	oth			
Read	o2h			
Write Uncorrectable	o4h			



Command	Code
Compare	05h
Write Zeroes	o8h
Dataset Management	09h



Table 15: NVMe Set/Get Features - Supported Features

Feature Supported redtares	FID
Arbitration	01h
Power Management	02h
LBA Range Type	03h
Temperature Threshold	04h
Error Recovery	05h
Volatile Write Cache	o6h
Number of Queues	07h
Interrupt Coalescing	o8h
Interrupt Vector Configuration	o9h
Write Atomicity Normal	oAh
Asynchronous Event Configuration	oBh
Autonomous Power State Transition	oCh
Timestamp	oEh
Host Controlled Thermal Management	10h
Non-Operational Power State Config	11h
Software Progress Marker	8oh

**Table 16: Supported Log Pages** 

Log Page	Log Identifier
Error Information	o1h
SMART/Health Information	o2h
Firmware Slot Information	o3h
Commands Supported and Effects	05h
Device Self-Test Log	o6h
Telemetry Host-Initiated	o7h
Telemetry Controller-Initiated	o8h



# 9. Identify Device Information

The following table describes the 4096 bytes of data the drive returns for the Identify command (06h).

Table 17: Identify Namespace Data Structure (CNS ooh)

Byte(s)	Default	Data Structure (CNS 00h) Data Field Type Information
•	Value	
0-7	XXXXh <sup>16</sup>	Namespace Size (NSZE)
8-15	XXXXh <sup>16</sup>	Namespace Capacity (NCAP)
16-23	XXXXh <sup>16</sup>	Namespace Utilization (NUSE)
24	ooh	Namespace Features (NSFEAT)
25	ooh	Number of LBA Formats (NLBAF)
26	ooh	Formatted LBA Size (FLBAS)
27	ooh	Metadata Capabilities (MC)
28	ooh	End-to -end Data Protection Capabilities (DPC
29	ooh	End-to -end Data Protection Type Settings (DPS)
30	ooh	Namespace Multi-path I/O and Namespace Sharing Capabilities (NMIC)
31	ooh	Reservation Capabilities (RESCAP)
32	80h	Format Progress Indicator (FPI)
33	01h	Deallocate Logical Block Features (DLFEAT)
34-35	ooooh	Namespace Atomic Write Unit Normal (NAWUN)
36-37	ooooh	Namespace Atomic Write Unit Power Fail (NAWUPF)
38-39	ooooh	Namespace Atomic Compare & Write Unit (NACWU)
40-41	ooooh	Namespace Atomic Boundary Size Normal (NABSN)
42-43	ooooh	Namespace Atomic Boundary Offset (NABO)
44-45	ooooh	Namespace Atomic Boundary Size Power Fail (NABSPF)
46-47	ooooh	Namespace Optimal IO Boundary (NOIOB)
48-63	All ooh	NVM Capacity (NVMCAP)
64-101	All ooh	Reserved
102-103	ooooh	Endurance Group Identifier (ENDGID)
104-119	537769737362 69748C6078X XXXXX0001h*	Namespace Globally Unique Identifier (NGUID)
120-127	8C6078XXXXXX 0001h	IEEE Extended Unique Identifier (EUI64)
128-131	00090000h	LBA Format o Support (LBAFo)
132-191	All ooh	LBA Format 1 to 15 Support (LBAF1 – LBAF15)
192-383	All ooh	Reserved
384-4095	All ooh	Vendor Specific (VS)

Table 18: Identify Controller Data Structure (CNS o1h)

Byte(s)	Default Value	Data Field Type Information
0-1	1DD4h	PCI Vendor ID (VID)
2-3	1DD4h	PCI Subsystem Vendor ID (SSVID)
4-23	XXXXh <sup>16</sup>	Serial Number (SN)
24-63	XXXXh <sup>16</sup>	Model Number (MN)
64-71	XXXXh <sup>16</sup>	Firmware Version (FR)

<sup>&</sup>lt;sup>16</sup> Values depend on device configuration.



	Default	
Byte(s)	Value	Data Field Type Information
72	o6h	Recommended Arbitration Burst (RAB)
73-75	8C6078h	IEEE OUI Identifier (IEEE)
76	ooh	Controller Multi-Path I/O and Namespace Sharing Capabilities (CMIC)
77	o6h	Maximum Data Transfer Size (MDTS)
78-79	ooooh	Controller ID (CNTLID)
80-83	00010400h	Version (VER)
84-87	000186A0h	Runtime D3 Resume Latency (RTD3R)
88-91	004C4B40h	Runtime D3 Entry Latency (RTD3E)
92-95	00000200h	Optional Asynchronous Events Supported (OAES)
96-99	00000002h	Controller Attributes (CTRATT)
100-101	ooooh	Read Recovery Levels Supported (RRLS)
102-110	All ooh	Reserved
111	01h	Controller Type (CNTRLTYPE)
112-127	All ooh	FRU Globally Unique Identifier (FGUID)
128-129	ooooh	Command Retry Delay Time 1 (CRDT1)
130-131	ooooh	Command Retry Delay Time 2 (CRDT2)
132-133	ooooh	Command Retry Delay Time 3 (CRDT3)
134-255	All ooh	Reserved
256-257	0017h	Optional Admin Command Support (OACS)
258	04h	Abort Command Limit (ACL)
259	07h	Asynchronous Event Request Limit (AERL)
260	14h	Firmware Updates (FRMW)
261	oFh	Log Page Attributes (LPA)
262	FFh	Error Log Page Entries (ELPE)
263	04h	Number of Power States Supported (NPSS)
264	ooh	Admin Vendor-Specific Command Configuration (AVSCC)
265	01h	Autonomous Power State Transition Attributes (APSTA)
266-267	016Bh	Warning Composite Temperature Threshold in Degrees Kelvin (WCTEMP)
268-269	0175h	Critical Composite Temperature Threshold in Degrees Kelvin (CCTEMP)
270-271	0032h	Maximum Time for Firmware Activation (MTFA)
272-275	oooooooh	Host Memory Buffer Preferred Size (HMPRE)
276-279	oooooooh	Host Memory Buffer Minimum Size (HMMIN)
280-295	All ooh	Total NVM Capacity (TNVMCAP)
296-311	All ooh	Unallocated NVM Capacity (UNVMCAP)
312-315	oooooooh	Replay Protected Memory Block Support (RPMBS)
316-317	0005h	Extended Device Self-test Time (EDSTT)
318	01h	Device Self-test Options (DSTO)
319	ooh	Firmware Update Granularity (FWUG)
320-321	ooooh	Keep Alive Support (KAS)
322-323	0001h	Host Controlled Thermal Management Attributes (HCTMA)
324-325	012Fh	Minimum Thermal Management Temperature (MNTMT)
326-327	0175h	Maximum Thermal Management Temperature (MXTMT)



Bytes         Value         Data Hela Type Information           238-331         60000003h         Sanitize Capabilities (SANICAP)           332-335         00000h         Host Memory Buffer Minimum Descriptors Entry Size (HMMINDS)           336-337         0000h         Host Memory Maximum Descriptors Entry Entry (HMMAXD)           338-339         0000h         NVM Set Identifier Maximum (RNETIOMAX)           340-341         000h         ANA Transition Time (ANATT)           343         00h         Asymmetric Namespace Access Capabilities (ANACAP)           344-347         00000000h         ANA Group Identifier Maximum (ANAGRPMAX)           388-351         00000000h         Number of ANA Group Identifiers (NANAGRPID)           352-355         000000000h         Persistent Event Log Size (PELS)           512         66h         Submission Queue Entry Size (CQES)           513         44h         Completion Queue Entry Size (CQES)           514-515         0000h         Maximum Outstanding Commands (MAXCMD)           516-519         0000h         Minimum Outstanding Commands (MAXCMD)           522-523         0000h         Fused Operation Support (FUSES)           524-05         04h         Format NYM Attributes (FNA)           525-527         07h         Volatile Wite Cache (WVC)<		In 6 11	
332-335         000000000h         Host Memory Buffer Minimum Descriptor Entry Size (HMMAXD)           336-337         0000h         Host Memory Maximum Descriptors Entries (HMMAXD)           338-339         0000h         NVM Set Identifier Maximum (MSETIDMAX)           340-341         000h         ANA Transition Time (ANATT)           343         00h         Asymmetric Namespace Access Capabilities (ANACAP)           348-347         00000000h         Number of ANA Group Identifier Maximum (ANAGRPMAX)           348-351         000000000h         Number of ANA Group Identifiers (NANAGRPID)           356-511         All ooh         Reserved           512         66h         Submission Queue Entry Size (QES)           513         44h         Completion Queue Entry Size (QES)           514-515         0000h         Maximum Outstanding Commands (MAXCMD)           516-519         0000oh         Humber of Namespaces (NN)           520-521         005Fh         Optional NVM Command Support (PUSES)           524         04h         Format NVM Attributes (FNA)           525         07h         Volatile Write Cache (VWC)           526-527         0000h         Atomic Write Unit Normal (AWUN)           528-533         0000h         Atomic Write Unit Normal (AWUN)	Byte(s)	Default Value	Data Field Type Information
336-337         0000h         Host Memory Maximum Descriptors Entries (HMMAXD)           338-339         0000h         NVM Set Identifier Maximum (RSETIDMAX)           340-341         000h         ANA Transition Time (ANATT)           342         00h         ANA Transition Time (ANATT)           343-34         00000000h         ANA Group Identifier Maximum (ANAGRPMAX)           348-351         00000000h         Number of ANA Group Identifiers (NANAGRPID)           352-355         00000000h         Persistent Event Log Size (PELS)           356-511         All ooh         Reserved           513         44h         Completion Queue Entry Size (QES)           514-515         0000h         Maximum Outstanding Commands (MAXCMD)           516-519         00000000h         Number of Namespaces (NN)           520-521         005Fh         Optional NVM Command Support (IOKS)           522-523         0000h         Fused Operation Support (FUSES)           524         04h         Format NVM Attributes (FNA)           525         07h         Volatile Write Cache (VWC)           526-527         0000h         Atomic Write Unit Normal (AWUN)           528-539         0000h         Atomic Write Unit Normal (AWUP)           531         00h         Names	328-331	60000003h	Sanitize Capabilities (SANICAP)
338-339 0000h NVM Set Identifier Maximum (NSETIDMAX) 340-341 0000h Endurance Group Identifier Maximum (ENDGIDMAX) 341 0000h ANA Transition Time (ANATT) 342 00h ANA Transition Time (ANATT) 343 00h Asymmetric Namespace Access Capabilities (ANACAP) 344-347 00000000h ANA Group Identifier Maximum (ANAGRPMAX) 352-355 00000000h Persistent Event Log Size (PELS) 356-511 All Ooh Reserved 352-355 0000000h Persistent Event Log Size (PELS) 356-510 All Ooh Reserved 352-355 000000 Maximum Outstanding Commands (MAXCMD) 3510-515 0000h Maximum Outstanding Commands (MAXCMD) 350-521 0005Fh Optional NVM Command Support (ONCS) 352-523 0000h Fused Operation Support (FUSES) 352-4 04h Format NVM Attributes (FNA) 352-527 0000h Atomic Write Loche (WWC) 3526-527 0000h Atomic Write Unit Power Fail (AWUPF) 350 000h NVM Vendor-Specific Command Configuration (NVSCC) 351 00h Namespace Write Protection Capabilities (NWPC) 352-533 0000h Atomic Compare and Write Unit (ACWU) 354-535 0000h Reserved 354-536 000000000h Atomic Compare and Write Unit (ACWU) 354-537 0000000 Maximum Number of Allowed Namespaces (MNAN) 354-767 All ooh Reserved 354-767 All ooh Power State o Descriptor 354-76207 XXXXIn <sup>16</sup> Power State o Descriptor 354-767 Power State 3 Descriptor 354-767 Power State 3 Descriptor 354-767 Power State 4 Descriptor 354-767 Power State 4 Descriptor 354-767 Power State 4 Descriptor 354-767 All ooh Power State 4 Descriptor 354-767 All ooh Power State 4 Descriptor 354-767 Power State 5 - 31 Descriptor (Not Applicable)	332-335	000000000h	Host Memory Buffer Minimum Descriptor Entry Size (HMMINDS)
340-3410000hEndurance Group Identifier Maximum (ENDGIDMAX)34200hANA Transition Time (ANATT)34300hAsymmetric Namespace Access Capabilities (ANACAP)344-34700000000hANA Group Identifier Maximum (ANAGRPMAX)348-35100000000hPersistent Event Log Size (PELS)352-35500000000hPersistent Event Log Size (PELS)51266hSubmission Queue Entry Size (SQES)51344hCompletion Queue Entry Size (CQES)514-5150000hMaximum Outstanding Commands (MAXCMD)516-51900000onMaximum Outstanding Commands (MAXCMD)520-521005FhOptional NVM Command Support (ONCS)522-5230000hFused Operation Support (FUSES)52404hFormat NVM Attributes (FNA)52507hVolatile Write Cache (WC)526-5270000hAtomic Write Unit Normal (AWUN)528-5290000hAtomic Write Unit Normal (AWUN)528-5290000hAtomic Write Unit Power Fail (AWUPF)53000hNVM Vendor-Specific Command Configuration (NVSCC)53100hNamespace Write Protection Capabilities (NWPC)532-5330000hAtomic Compare and Write Unit (ACWU)534-5350000hAtomic Compare and Write Unit (ACWU)536-53900000hAtomic Compare and Write Unit (ACWU)540-543000000hReserved540-543000000hMaximum Number of Allowed Namespaces (MNAN)544-767All oohReserved2080-2011 </td <td>336-337</td> <td>ooooh</td> <td>Host Memory Maximum Descriptors Entries (HMMAXD)</td>	336-337	ooooh	Host Memory Maximum Descriptors Entries (HMMAXD)
342         ooh         ANA Transition Time (ANATT)           343         ooh         Asymmetric Namespace Access Capabilities (ANACAP)           344-347         ooooooooh         ANA Group Identifier Maximum (ANAGRPMAX)           348-351         ooooooooh         Number of ANA Group Identifiers (NANAGRPID)           352-355         ooooooooh         Persistent Event Log Size (PELS)           356-511         All ooh         Reserved           512         66h         Submission Queue Entry Size (QES)           513         44h         Completion Queue Entry Size (QES)           514-515         ooooh         Maximum Outstanding Commands (MAXCMD)           516-519         oooooh         Maximum Outstanding Commands (MAXCMD)           520-521         oo5Fh         Optional NVM Command Support (ONCS)           522-523         ooooh         Fused Operation Support (FUSES)           524         O4h         Format NVM Attributes (FNA)           525         O7h         Volatile Write Cache (WWC)           526-527         ooooh         Atomic Write Unit Normal (AWUN)           528-529         oooh         Atomic Write Unit Power Fall (AWUPF)           530         ooh         NVM Vendor-Specific Command Configuration (NVSCC)           531-535         ooooh </td <td>338-339</td> <td>ooooh</td> <td>NVM Set Identifier Maximum (NSETIDMAX)</td>	338-339	ooooh	NVM Set Identifier Maximum (NSETIDMAX)
343         ooh         Asymmetric Namespace Access Capabilities (ANACAP)           344-347         oooooooh         ANA Group Identifier Maximum (ANAGRPMAX)           348-351         oooooooh         Number of ANA Group Identifiers (NANAGRPID)           352-355         oooooooh         Persistent Event Log Size (PELS)           336-511         All ooh         Reserved           512         66h         Submission Queue Entry Size (SQES)           513         44h         Completion Queue Entry Size (CQES)           514-515         ooooh         Maximum Outstanding Commands (MAXCMD)           516-519         ooooonooh         Meximum Outstanding Commands (MAXCMD)           520-521         oo5Fh         Optional NVM Command Support (ONCS)           522-523         ooooh         Fused Operation Support (FUSES)           524         04h         Format NVM Attributes (FNA)           525-527         oooh         Atomic Write Unit Normal (AWUN)           528-529         ooooh         Atomic Write Unit Power Fail (AWUPF)           530         ooh         NVM Vendor-Specific Command Configuration (NVSCC)           531         ooh         Namespace Write Protection Capabilities (NWPC)           532-533         ooooh         Atomic Compare and Write Unit (ACWU)	340-341	ooooh	Endurance Group Identifier Maximum (ENDGIDMAX)
344-347         0000000h         ANA Group Identifier Maximum (ANAGRPMAX)           348-351         0000000h         Number of ANA Group Identifiers (NANAGRPID)           352-355         0000000h         Persistent Event Log Size (PELS)           356-511         All Ooh         Reserved           512         66h         Submission Queue Entry Size (CQES)           513         44h         Completion Queue Entry Size (CQES)           514-515         0000h         Maximum Outstanding Commands (MAXCMD)           516-519         0000000h         Number of Namespaces (NN)           520-521         005fh         Optional NVM Command Support (GNCS)           522-523         0000h         Fused Operation Support (FUSES)           524         04h         Format NVM Attributes (FNA)           525-527         0000h         Atomic Write Unit Normal (AWUP)           526-527         0000h         Atomic Write Unit Power Fail (AWUPF)           530         00h         NVM Vendor-Specific Command Configuration (NVSCC)           531         00h         Namespace Write Protection Capabilities (NWPC)           532-533         0000h         Atomic Compare and Write Unit (ACWU)           534-535         0000h         Reserved           540-543         00000oh	342	ooh	ANA Transition Time (ANATT)
348-351         00000000h         Number of ANA Group Identifiers (NANAGRPID)           352-355         0000000h         Persistent Event Log Size (PELS)           366-511         All ooh         Reserved           512         66h         Submission Queue Entry Size (CQES)           513         44h         Completion Queue Entry Size (CQES)           514-515         0000h         Maximum Outstanding Commands (MAXCMD)           516-519         00000000th         Number of Namespaces (NN)           520-521         005FN         Optional NVM Command Support (ONCS)           522-523         0000h         Fused Operation Support (FUSES)           524         04h         Format NVM Attributes (FNA)           525         07h         Volatile Write Cache (WWC)           526-527         0000h         Atomic Write Unit Normal (AWUN)           528-529         0000h         Atomic Write Unit Power Fail (AWUPF)           530         00h         NVM Vendor-Specific Command Configuration (NVSCC)           531         00h         Namespace Write Protection Capabilities (NWPC)           532-533         0000h         Atomic Compare and Write Unit (ACWU)           534-535         0000h         Reserved           540-543         00000obh         Ascatter Ga	343	ooh	Asymmetric Namespace Access Capabilities (ANACAP)
352-355         0000000h         Persistent Event Log Size (PELS)           366-511         All ooh         Reserved           512         66h         Submission Queue Entry Size (SQES)           513         44h         Completion Queue Entry Size (CQES)           514-515         0000h         Maximum Outstanding Commands (MAXCMD)           516-519         00000001h         Number of Namespaces (NN)           520-521         005Fh         Optional NVM Command Support (ONCS)           522-523         0000h         Fused Operation Support (FUSES)           524         04h         Format NVM Attributes (FNA)           525         07h         Volatile Write Cache (WWC)           526-527         0000h         Atomic Write Unit Normal (AWUN)           528-529         0000h         Atomic Write Unit Power Fail (AWUPF)           530         00h         NVM Vendor-Specific Command Configuration (NVSCC)           531         00h         Namespace Write Protection Capabilities (NWPC)           532-533         0000h         Reserved           536-539         0000h         Reserved           540-543         0000oh         Maximum Number of Allowed Namespaces (MNAN)           544-767         All ooh         Reserved <td< td=""><td>344-347</td><td>oooooooh</td><td>ANA Group Identifier Maximum (ANAGRPMAX)</td></td<>	344-347	oooooooh	ANA Group Identifier Maximum (ANAGRPMAX)
356-511All oohReserved51266hSubmission Queue Entry Size (SQES)51344hCompletion Queue Entry Size (CQES)514-5150000hMaximum Outstanding Commands (MAXCMD)516-519000000001hNumber of Namespaces (NN)520-521005FhOptional NVM Command Support (ONCS)522-5230000hFused Operation Support (FUSES)52404hFormat NVM Attributes (FNA)52507hVolatile Write Cache (WWC)526-5270000hAtomic Write Unit Normal (AWUN)528-5290000hAtomic Write Unit Power Fail (AWUPF)53000hNVM Vendor-Specific Command Configuration (NVSCC)53100hNamespace Write Protection Capabilities (NWPC)532-5330000hAtomic Compare and Write Unit (ACWU)534-5350000hReserved540-5430000000hScatter Gather List Support (SGLS)540-5430000000hReserved768-1023XXXXIn <sup>16</sup> NVM Subsystem NVMe Qualified Name (SUBNQN)1024-2047All oohReserved2048-2079XXXXIn <sup>16</sup> Power State 0 Descriptor2080-2111XXXXIn <sup>16</sup> Power State 1 Descriptor2112-2143XXXXIn <sup>16</sup> Power State 2 Descriptor2144-2175XXXXIn <sup>16</sup> Power State 3 Descriptor2208-3071All oohPower State 4 Descriptor2208-3071All oohPower State 5 - 31 Descriptor (Not Applicable)	348-351	oooooooh	Number of ANA Group Identifiers (NANAGRPID)
512 66h Submission Queue Entry Size (SQES) 513 44h Completion Queue Entry Size (CQES) 514-515 0000h Maximum Outstanding Commands (MAXCMD) 516-519 000000001h Number of Namespaces (NN) 520-521 005Fh Optional NVM Command Support (ONCS) 522-523 0000h Fused Operation Support (FUSES) 524 04h Format NVM Attributes (FNA) 525 07h Volatile Write Cache (WWC) 526-527 0000h Atomic Write Unit Normal (AWUN) 528-529 0000h Atomic Write Unit Normal (AWUNP) 530 00h NVM Vendor-Specific Command Configuration (NVSCC) 531 00h Namespace Write Protection Capabilities (NWPC) 532-533 0000h Atomic Compare and Write Unit (ACWU) 534-535 0000h Reserved 536-539 00000000h Scatter Gather List Support (SGLS) 544-767 All ooh Reserved 768-1023 XXXXT1 <sup>6</sup> NVM Subsystem NVMe Qualified Name (SUBNQN) 1024-2047 All ooh Reserved 2048-2079 XXXXI1 <sup>6</sup> Power State 0 Descriptor 2080-2111 XXXXXI1 <sup>6</sup> Power State 1 Descriptor 2112-2143 XXXXI1 <sup>6</sup> Power State 3 Descriptor 212-2143 XXXXXI1 <sup>6</sup> Power State 3 Descriptor 2176-2207 XXXXI1 <sup>6</sup> Power State 4 Descriptor 2176-2207 XXXXI1 <sup>6</sup> Power State 5 - 31 Descriptor (Not Applicable)	352-355	oooooooh	Persistent Event Log Size (PELS)
513         44h         Completion Queue Entry Size (QES)           514-515         0000h         Maximum Outstanding Commands (MAXCMD)           516-519         000000001h         Number of Namespaces (NN)           520-521         005Fh         Optional NVM Command Support (ONCS)           522-523         0000h         Fused Operation Support (FUSES)           524         04h         Format NVM Attributes (FNA)           525         07h         Volatile Write Cache (VWC)           526-527         0000h         Atomic Write Unit Normal (AWUN)           528-529         0000h         Atomic Write Unit Power Fail (AWUPF)           530         00h         NVM Vendor-Specific Command Configuration (NVSCC)           531         00h         Namespace Write Protection Capabilities (NWPC)           532-533         0000h         Atomic Compare and Write Unit (ACWU)           534-535         0000h         Reserved           540-543         0000000h         Scatter Gather List Support (SGLS)           540-543         0000000h         Maximum Number of Allowed Namespaces (MNAN)           544-767         All ooh         Reserved           2048-2079         XXXXh <sup>16</sup> NVM Subsystem NVMe Qualified Name (SUBNQN)           1024-2047         All ooh	356-511	All ooh	Reserved
514-5150000hMaximum Outstanding Commands (MAXCMD)516-519000000001hNumber of Namespaces (NN)520-521005FhOptional NVM Command Support (NCS)522-5230000hFused Operation Support (FUSES)52404hFormat NVM Attributes (FNA)52507hVolatile Write Cache (WC)526-5270000hAtomic Write Unit Normal (AWUN)528-5290000hAtomic Write Unit Power Fail (AWUPF)53000hNVM Vendor-Specific Command Configuration (NVSCC)53100hNamespace Write Protection Capabilities (NWPC)532-5330000hAtomic Compare and Write Unit (ACWU)534-5350000hReserved536-53900000000hScatter Gather List Support (SGLS)540-54300000000hMaximum Number of Allowed Namespaces (MNAN)544-767All oohReserved768-1023XXXXh <sup>16</sup> NVM Subsystem NVMe Qualified Name (SUBNQN)1024-2047All oohReserved2048-2079XXXXh <sup>16</sup> Power State 0 Descriptor2080-2111XXXXh <sup>16</sup> Power State 1 Descriptor2112-2143XXXXh <sup>16</sup> Power State 2 Descriptor2144-2175XXXXh <sup>16</sup> Power State 3 Descriptor2176-2207XXXXh <sup>16</sup> Power State 4 Descriptor2208-3071All oohPower State 5 - 31 Descriptor (Not Applicable)	512	66h	Submission Queue Entry Size (SQES)
516-519000000001hNumber of Namespaces (NN)520-521005FhOptional NVM Command Support (ONCS)522-5230000hFused Operation Support (FUSES)52404hFormat NVM Attributes (FNA)52507hVolatile Write Cache (WWC)526-5270000hAtomic Write Unit Normal (AWUN)528-5290000hAtomic Write Unit Power Fail (AWUPF)53000hNVM Vendor-Specific Command Configuration (NVSCC)53100hNamespace Write Protection Capabilities (NWPC)532-5330000hAtomic Compare and Write Unit (ACWU)534-5350000hReserved536-53900000000hScatter Gather List Support (SGLS)540-54300000000hMaximum Number of Allowed Namespaces (MNAN)544-767All oohReserved768-1023XXXXXhi6NVM Subsystem NVMe Qualified Name (SUBNQN)1024-2047All oohReserved2048-2079XXXXXhi6Power State 0 Descriptor2080-2111XXXXXhi6Power State 1 Descriptor2112-2143XXXXXhi6Power State 2 Descriptor2144-2175XXXXXhi6Power State 3 Descriptor2176-2207XXXXhi6Power State 4 Descriptor2208-3071All oohPower State 5 - 31 Descriptor (Not Applicable)	513	44h	Completion Queue Entry Size (CQES)
520-521         005Fh         Optional NVM Command Support (ONCS)           522-523         0000h         Fused Operation Support (FUSES)           524         04h         Format NVM Attributes (FNA)           525         07h         Volatile Write Cache (WWC)           526-527         0000h         Atomic Write Unit Normal (AWUN)           528-529         0000h         Atomic Write Unit Power Fail (AWUPF)           530         00h         NVM Vendor-Specific Command Configuration (NVSCC)           531         00h         Namespace Write Protection Capabilities (NWPC)           532-533         0000h         Atomic Compare and Write Unit (ACWU)           534-535         0000h         Reserved           540-543         0000000h         Scatter Gather List Support (SGLS)           540-543         0000000h         Maximum Number of Allowed Namespaces (MNAN)           544-767         All ooh         Reserved           768-1023         XXXXh <sup>16</sup> NVM Subsystem NVMe Qualified Name (SUBNQN)           1024-2047         All ooh         Reserved           2048-2079         XXXXxh <sup>16</sup> Power State 0 Descriptor           212-2143         XXXXxh <sup>16</sup> Power State 1 Descriptor           214-2175         XXXXXh <sup>16</sup> Power Stat	514-515	ooooh	Maximum Outstanding Commands (MAXCMD)
522-5230000hFused Operation Support (FUSES)52404hFormat NVM Attributes (FNA)52507hVolatile Write Cache (WWC)526-5270000hAtomic Write Unit Normal (AWUN)528-5290000hAtomic Write Unit Power Fail (AWUPF)53000hNVM Vendor-Specific Command Configuration (NVSCC)53100hNamespace Write Protection Capabilities (NWPC)532-5330000hAtomic Compare and Write Unit (ACWU)534-5350000hReserved540-54300000000hScatter Gather List Support (SGLS)540-54300000000hMaximum Number of Allowed Namespaces (MNAN)544-767All oohReserved768-1023XXXXh16NVM Subsystem NVMe Qualified Name (SUBNQN)1024-2047All oohReserved2048-2079XXXXh16Power State 0 Descriptor2080-2111XXXXXh16Power State 1 Descriptor2112-2143XXXXh16Power State 2 Descriptor2144-2175XXXXh16Power State 4 Descriptor2176-2207XXXXh16Power State 4 Descriptor2208-3071All oohPower State 5 - 31 Descriptor (Not Applicable)	516-519	000000001h	Number of Namespaces (NN)
524 04h Format NVM Attributes (FNA) 525 07h Volatile Write Cache (WWC) 526-527 0000h Atomic Write Unit Normal (AWUN) 528-529 0000h Atomic Write Unit Power Fail (AWUPF) 530 00h NVM Vendor-Specific Command Configuration (NVSCC) 531 00h Namespace Write Protection Capabilities (NWPC) 532-533 0000h Atomic Compare and Write Unit (ACWU) 534-535 0000h Reserved 536-539 00000000h Scatter Gather List Support (SGLS) 540-543 00000000h Maximum Number of Allowed Namespaces (MNAN) 544-767 All ooh Reserved 768-1023 XXXXh16 NVM Subsystem NVMe Qualified Name (SUBNQN) 1024-2047 All ooh Reserved 2048-2079 XXXXh16 Power State 0 Descriptor 2080-2111 XXXXh16 Power State 1 Descriptor 2112-2143 XXXXh16 Power State 2 Descriptor 2144-2175 XXXXh16 Power State 3 Descriptor 216-2207 XXXXh16 Power State 4 Descriptor 2176-2207 XXXXh16 Power State 4 Descriptor	520-521	005Fh	Optional NVM Command Support (ONCS)
525 07h Volatile Write Cache (WWC) 526-527 0000h Atomic Write Unit Normal (AWUN) 528-529 0000h Atomic Write Unit Power Fail (AWUPF) 530 00h NVM Vendor-Specific Command Configuration (NVSCC) 531 00h Namespace Write Protection Capabilities (NWPC) 532-533 0000h Atomic Compare and Write Unit (ACWU) 534-535 0000h Reserved 536-539 0000000h Scatter Gather List Support (SGLS) 540-543 0000000h Maximum Number of Allowed Namespaces (MNAN) 544-767 All ooh Reserved 768-1023 XXXXh16 NVM Subsystem NVMe Qualified Name (SUBNQN) 1024-2047 All ooh Reserved 2048-2079 XXXXh16 Power State 0 Descriptor 2080-2111 XXXXh16 Power State 1 Descriptor 2112-2143 XXXXh16 Power State 2 Descriptor 2112-2143 XXXXh16 Power State 3 Descriptor 2114-2175 XXXXh16 Power State 4 Descriptor 2126-2207 XXXXh16 Power State 4 Descriptor (Not Applicable)	522-523	ooooh	Fused Operation Support (FUSES)
526-5270000hAtomic Write Unit Normal (AWUN)528-5290000hAtomic Write Unit Power Fail (AWUPF)53000hNVM Vendor-Specific Command Configuration (NVSCC)53100hNamespace Write Protection Capabilities (NWPC)532-5330000hAtomic Compare and Write Unit (ACWU)534-5350000hReserved536-5390000000hScatter Gather List Support (SGLS)540-5430000000hMaximum Number of Allowed Namespaces (MNAN)544-767All oohReserved768-1023XXXXh16NVM Subsystem NVMe Qualified Name (SUBNQN)1024-2047All oohReserved2048-2079XXXXh16Power State 0 Descriptor2080-2111XXXXh16Power State 1 Descriptor2112-2143XXXXh16Power State 2 Descriptor2112-2143XXXXh16Power State 3 Descriptor216-2207XXXXh16Power State 4 Descriptor2208-3071All oohPower State 5 - 31 Descriptor (Not Applicable)	524	04h	Format NVM Attributes (FNA)
528-529 0000h Atomic Write Unit Power Fail (AWUPF) 530 00h NVM Vendor-Specific Command Configuration (NVSCC) 531 00h Namespace Write Protection Capabilities (NWPC) 532-533 0000h Atomic Compare and Write Unit (ACWU) 534-535 0000h Reserved 536-539 0000000h Scatter Gather List Support (SGLS) 540-543 0000000h Maximum Number of Allowed Namespaces (MNAN) 544-767 All ooh Reserved 768-1023 XXXXXh16 NVM Subsystem NVMe Qualified Name (SUBNQN) 1024-2047 All ooh Reserved 2048-2079 XXXXXh16 Power State o Descriptor 2080-2111 XXXXh16 Power State 1 Descriptor 2112-2143 XXXXh16 Power State 2 Descriptor 2144-2175 XXXXh16 Power State 3 Descriptor 216-2207 XXXXh16 Power State 4 Descriptor 2176-2207 XXXXh16 Power State 5 - 31 Descriptor (Not Applicable)	525	07h	Volatile Write Cache (VWC)
530oohNVM Vendor-Specific Command Configuration (NVSCC)531oohNamespace Write Protection Capabilities (NWPC)532-533oooohAtomic Compare and Write Unit (ACWU)534-535oooohReserved536-539oooooooohScatter Gather List Support (SGLS)540-543oooooooohMaximum Number of Allowed Namespaces (MNAN)544-767All oohReserved768-1023XXXXh16NVM Subsystem NVMe Qualified Name (SUBNQN)1024-2047All oohReserved2048-2079XXXXXh16Power State o Descriptor2080-2111XXXXXh16Power State 1 Descriptor2112-2143XXXXh16Power State 2 Descriptor2144-2175XXXXXh16Power State 3 Descriptor2176-2207XXXXh16Power State 4 Descriptor2208-3071All oohPower State 5 - 31 Descriptor (Not Applicable)	526-527	ooooh	Atomic Write Unit Normal (AWUN)
531OohNamespace Write Protection Capabilities (NWPC)532-533OooohAtomic Compare and Write Unit (ACWU)534-535OooohReserved536-539OoooooohScatter Gather List Support (SGLS)540-543OooooooohMaximum Number of Allowed Namespaces (MNAN)544-767All OohReserved768-1023XXXXh16NVM Subsystem NVMe Qualified Name (SUBNQN)1024-2047All OohReserved2048-2079XXXXh16Power State 0 Descriptor2080-2111XXXXh16Power State 1 Descriptor2112-2143XXXXh16Power State 2 Descriptor2144-2175XXXXh16Power State 3 Descriptor2176-2207XXXXh16Power State 4 Descriptor2208-3071All OohPower State 5 - 31 Descriptor (Not Applicable)	528-529	ooooh	Atomic Write Unit Power Fail (AWUPF)
532-533 0000h Atomic Compare and Write Unit (ACWU)  534-535 0000h Reserved  536-539 0000000h Scatter Gather List Support (SGLS)  540-543 0000000h Maximum Number of Allowed Namespaces (MNAN)  544-767 All ooh Reserved  768-1023 XXXXh16 NVM Subsystem NVMe Qualified Name (SUBNQN)  1024-2047 All ooh Reserved  2048-2079 XXXXh16 Power State 0 Descriptor  2080-2111 XXXXh16 Power State 1 Descriptor  2112-2143 XXXXh16 Power State 2 Descriptor  2144-2175 XXXXh16 Power State 3 Descriptor  2176-2207 XXXXh16 Power State 4 Descriptor	530	ooh	NVM Vendor-Specific Command Configuration (NVSCC)
534-535 0000h Reserved 536-539 0000000h Scatter Gather List Support (SGLS) 540-543 0000000h Maximum Number of Allowed Namespaces (MNAN) 544-767 All ooh Reserved 768-1023 XXXXh <sup>16</sup> NVM Subsystem NVMe Qualified Name (SUBNQN) 1024-2047 All ooh Reserved 2048-2079 XXXXh <sup>16</sup> Power State o Descriptor 2080-2111 XXXXh <sup>16</sup> Power State 1 Descriptor 2112-2143 XXXXh <sup>16</sup> Power State 2 Descriptor 2114-2175 XXXXh <sup>16</sup> Power State 3 Descriptor 2176-2207 XXXXh <sup>16</sup> Power State 4 Descriptor 2208-3071 All ooh Power State 5 - 31 Descriptor (Not Applicable)	531	ooh	Namespace Write Protection Capabilities (NWPC)
536-539 0000000h Scatter Gather List Support (SGLS) 540-543 0000000h Maximum Number of Allowed Namespaces (MNAN) 544-767 All ooh Reserved 768-1023 XXXXh <sup>16</sup> NVM Subsystem NVMe Qualified Name (SUBNQN) 1024-2047 All ooh Reserved 2048-2079 XXXXh <sup>16</sup> Power State o Descriptor 2080-2111 XXXXh <sup>16</sup> Power State 1 Descriptor 2112-2143 XXXXh <sup>16</sup> Power State 2 Descriptor 2144-2175 XXXXh <sup>16</sup> Power State 3 Descriptor 2176-2207 XXXXh <sup>16</sup> Power State 4 Descriptor 2208-3071 All ooh Power State 5 - 31 Descriptor (Not Applicable)	532-533	ooooh	Atomic Compare and Write Unit (ACWU)
540-54300000000hMaximum Number of Allowed Namespaces (MNAN)544-767All oohReserved768-1023XXXXh16NVM Subsystem NVMe Qualified Name (SUBNQN)1024-2047All oohReserved2048-2079XXXXh16Power State 0 Descriptor2080-2111XXXXXh16Power State 1 Descriptor2112-2143XXXXh16Power State 2 Descriptor2144-2175XXXXh16Power State 3 Descriptor2176-2207XXXXh16Power State 4 Descriptor2208-3071All oohPower State 5 - 31 Descriptor (Not Applicable)	534-535	ooooh	Reserved
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2048-2079 XXXXh <sup>16</sup> Power State o Descriptor  2080-2111 XXXXh <sup>16</sup> Power State 1 Descriptor  2112-2143 XXXXh <sup>16</sup> Power State 2 Descriptor  2144-2175 XXXXh <sup>16</sup> Power State 3 Descriptor  2176-2207 XXXXh <sup>16</sup> Power State 4 Descriptor  2208-3071 All ooh Power State 5 - 31 Descriptor (Not Applicable)	768-1023	XXXXh <sup>16</sup>	NVM Subsystem NVMe Qualified Name (SUBNQN)
2080-2111 XXXXh <sup>16</sup> Power State 1 Descriptor 2112-2143 XXXXh <sup>16</sup> Power State 2 Descriptor 2144-2175 XXXXh <sup>16</sup> Power State 3 Descriptor 2176-2207 XXXXh <sup>16</sup> Power State 4 Descriptor 2208-3071 All ooh Power State 5 - 31 Descriptor (Not Applicable)	1024-2047	All ooh	Reserved
2112-2143 XXXXh <sup>16</sup> Power State 2 Descriptor 2144-2175 XXXXh <sup>16</sup> Power State 3 Descriptor 2176-2207 XXXXh <sup>16</sup> Power State 4 Descriptor 2208-3071 All ooh Power State 5 - 31 Descriptor (Not Applicable)	2048-2079	XXXXh <sup>16</sup>	Power State o Descriptor
2144-2175 XXXXh <sup>16</sup> Power State 3 Descriptor 2176-2207 XXXXh <sup>16</sup> Power State 4 Descriptor 2208-3071 All ooh Power State 5 - 31 Descriptor (Not Applicable)	2080-2111	XXXXh <sup>16</sup>	Power State 1 Descriptor
2176-2207 XXXXh <sup>16</sup> Power State 4 Descriptor 2208-3071 All ooh Power State 5 - 31 Descriptor (Not Applicable)	2112-2143	XXXXh <sup>16</sup>	Power State 2 Descriptor
2208–3071 All ooh Power State 5 – 31 Descriptor (Not Applicable)	2144-2175	XXXXh <sup>16</sup>	Power State 3 Descriptor
	2176-2207	XXXXh <sup>16</sup>	Power State 4 Descriptor
Vender Specific (VS)	2208-3071	All ooh	Power State 5 - 31 Descriptor (Not Applicable)
30/2-4095 - Venuoi specific (vs)	3072-4095	_	Vendor Specific (VS)



# 10. Health Monitoring Functionality

The N3602 SSDs support Self-Monitoring, Analysis, and Reporting Technology. The SSD supports log information as defined in the NVMe specification.

See the following table for the 512-byte data structure of the SMART/Health Information log page:

Table 19: SMART/Health Information (Log Identifier 02h)

Byte(s)	Description
0	<ul> <li>Critical warning: for the state of the controller</li> <li>Bit o: If set to '1', then the available spare capacity has fallen below the threshold</li> <li>Bit 1: If set to '1', then a temperature is greater than or equal to an over temperature threshold; or ess than or equal to an under temperature threshold</li> <li>Bit 2: If set to '1', then the NVM subsystem reliability has been degraded due to significant media related errors or any internal error that degrades NVM subsystem reliability. This bit can also be set on a failure of the energy management circuit. Please see chapter 10.1</li> <li>Bit 3: If set to '1', then all of the media has been placed in read only mode</li> </ul>
1-2	Composite Temperature: in degrees Kelvin
3	Available Spare: as a percentage of remaining spare capacity
4	Available Spare Threshold
5	Percentage Used: Estimate of the percentage of the NVM subsystem life left based on usage
6-31	Reserved
32-47	Data Units Read: Number of 512-byte sectors read by the host (in 1000 increments)
48-63	Data Units Written: Number of 512-byte sectors written by the host (in 1000 increments)
64-79	Host Read Commands: Number of Read commands completed by the controller
80-95	Host Write Commands: Number of Write commands completed by the controller
96-111	Controller Busy Time: Amount of time, in minutes, the controller was busy with I/O commands
112-127	Power Cycles: Number of power cycles that has occurred over the life of the drive
128-143	Power On Hours: Number of hours the device has been powered over the life of the drive (does not include the time the device is in low power state conditions)
144-159	Unsafe Shutdowns: Number of shutdowns that occurred without a shutdown notification
160-175	Media and Data Integrity Errors: Number of unrecoverable errors, including UECC, CRC checksum failures, and LBA mismatches, that occurred over the life of the drive
176-191	Number of Error Information Log Entries: Number of entries recorded in the Error Information log over the life of the drive
192-195	Warning Composite Temperature Time: Amount of time, in minutes, the controller was operational and the Composite Temperature was equal to or greater than the Warning Composite Temperature Threshold (WCTEMP) but less than the Critical Composite Temperature Threshold (CCTEMP)
196-199	Critical Composite Temperature Time: Amount of time, in minutes, the controller was operational and the Composite Temperature was equal to or greater than the Critical Composite Temperature Threshold (CCTEMP)
200-201	Temperature Sensor 1: Current controller Tjunction temperature, in degrees Kelvin
202-203	Temperature Sensor 2: Current composite temperature, in degrees Kelvin
204-205	Temperature Sensor 3: Current maximum NAND temperature, in degrees Kelvin
206-215	Not used



216-219	Thermal Management Temperature 1 Transition Count: number of times the controller transitioned to lower power active power states or performed vendor specific thermal management actions while minimizing the impact on performance
220-223	Thermal Management Temperature 2 Transition Count: number of times the controller transitioned to lower power active power states or performed vendor specific thermal management actions regardless of the impact on performance
224-227	Total Time For Thermal Management Temperature 1: number of seconds that the controller had transitioned to lower power active power states or performed vendor specific thermal management actions while minimizing the impact on performance
228-231	Total Time For Thermal Management Temperature 2: number of seconds that the controller had transitioned to lower power active power states or performed vendor specific thermal management actions regardless of the impact on performance
232-511	Reserved

The following data structure is applied to both Telemetry Host-Initiated log and Telemetry Controller-Initiated log:

Table 20: Telemetry Log (Log Identifier 07h)

Byte(s)	Description				
Telemetry Header					
0	Log Identifier: This field shall be 07h				
1-4	Reserved				
5-7	IEEE OUI Identifier (IEEE):				
4	Telemetry Host-Initiated Data Area 1 Last Block: This field shall be ooo1h				
10-381	Reserved				
382	Telemetry Controller-Initiated Data Available				
383	Telemetry Controller–Initiated Data Generation Number				
384-511	Reserved				
Telemetry Data Block 1					
528-529	Minimum Temperature, in degrees Kelvin				
530-531	Current Temperature, in degrees Kelvin				
532-533	Maximum Temperature, in degrees Kelvin				
560-561	Number of valid spare blocks				
562-563	Number of initial spare blocks				
564-565	Run Time Bad Block Count				
596-599	Maximum Erase Count <sup>17</sup>				
604-607	Average Erase Count <sup>17</sup>				
624-627	Rated Erase Count <sup>17</sup>				
640	Remaining Life Percentage Based On P/E				
641	Remaining Life Percentage Based On Spare Blocks				
647	Cap Health Status (see PowerSafe Monitoring)				



772-776	NVMe/PCIe Reset Count			
804-807	PCIe Gen1 Link Speed Count			
808-811	PCIe Genz Link Speed Count			
812-815	PCIe Gen3 Link Speed Count			
816-823	PCIe ECRC Event Count			
824-831	PCIe LCRC Event Count			
873	PCIe Power On Link Speed			
876	PCIe Current Link Speed			
877	PCIe Current Link Width			
932-935	PCIe x1 Link Width Count			
936-939	PCle x2 Link Width Count			
940-943	PCle x4 Link Width Count			
944-951	PCIe L1 Event Count			

#### 10.1 PowerSafe Monitoring

The Swissbit N<sub>3</sub>602 PowerSafe series features an energy management circuit that allows the drive to flush all volatile data in case of a sudden power off event.

In case of an energy management circuit failure the drive will report a critical warning in the SMART/Health Information (Log Identifier o2h) log page. The "Critical Warning" field will report a value of 2h, "NVM subsystem reliability has been degraded due to significant media related errors or any internal error that degrades NVM subsystem reliability".

In case of a critical warning please check the "Cap Health Status" field in Table 20: Telemetry Log (Log Identifier o7h):

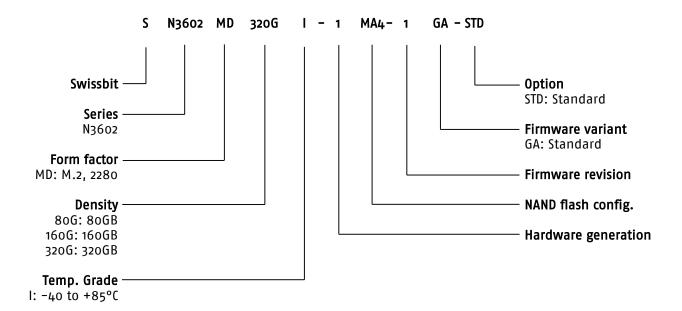
Cap Health Status bito = 1h: Capacitor health PASS
 Cap Health Status bito = 0h: Capacitor health FAIL

First SMART/Health Information is reported after 30 seconds after power up.





## 11. Part Number Decoder





# 12. Marking Specification

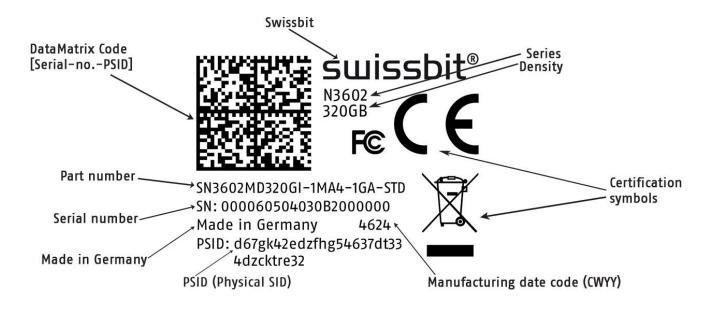
#### 12.1 Top View

Figure 4: N3602 top view



#### 12.2 Print on the label

Figure 5: N3602 label details





## 13. Revision History

Table 21: Document Revision History

Date	Revision	Description	Revision Details
27-Feb-2024	0.90	Preliminary release	Doc. req. no. 6914
13-May-2024	0.91	Product features, Safety features, Figure 1, Figure 3 and Table 13 have been updated	Doc. req. no. 7081
17-0ct-2024	1.00	Initial release with updated Endurance, Performance and Current Consumption values and product illustrations.	-

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