M.2 2280 SATA SSD

Product Name: **UM28S3TNN**

Capacity : **128GB、256GB、512GB、1TB、2TB**

Revision History

Revision	Date	Description	Editor
1.0	July. 5, 2022	Initial release	

Table of Contents

Key Features

- **Capacity:**
  - 128GB, 256GB, 512GB, 1TB, 2TB
- **NAND Flash:** 3D TLC 112L
- **Form Factor:** M.2 2280
- **Host Interface:**
  - Serial ATA 6Gb/s interface
  - Compliant with ATA-8 Standard
  - Compliant with SATA Revision 3.1
- **Flash Management:**
  - LDPC ECC engine
  - RAID engine
  - Enhanced endurance by static /dynamic wear leveling
  - Bad block management
  - Garbage collection
  - TRIM command
  - SLC cache technology
  - NCQ command
- **Data Integrity:**
  - Thermal throttling
  - S.M.A.R.T. monitor
- **Performance:**
  - Sequential Read: Up to 560 MB/s
  - Sequential Write: Up to 520 MB/s
  - Random 4K Read: Up to 93K IOPS
  - Random 4K Write: Up to 67K IOPS
- **Power Consumption:**
  - Device Sleep: 4mW
  - Slumber: 0.0057W
  - Idle: 0.65W
  - Sequential Read/Write: 1.58W/1.18W
  - Random Read/Write: 1.44W/1.03W
- **Temperature:**
  - Industrial: -40°C – 85°C
  - Non-operation: -55°C ~ 95°C
- **Reliability:**
  - Shock: 1500G/0.5ms
  - Vibration: 20G Peak, 20~2000Hz
  - MTBF: 3,000,000 hours
- **Endurance:**
  - TBW: Up to 2400TB

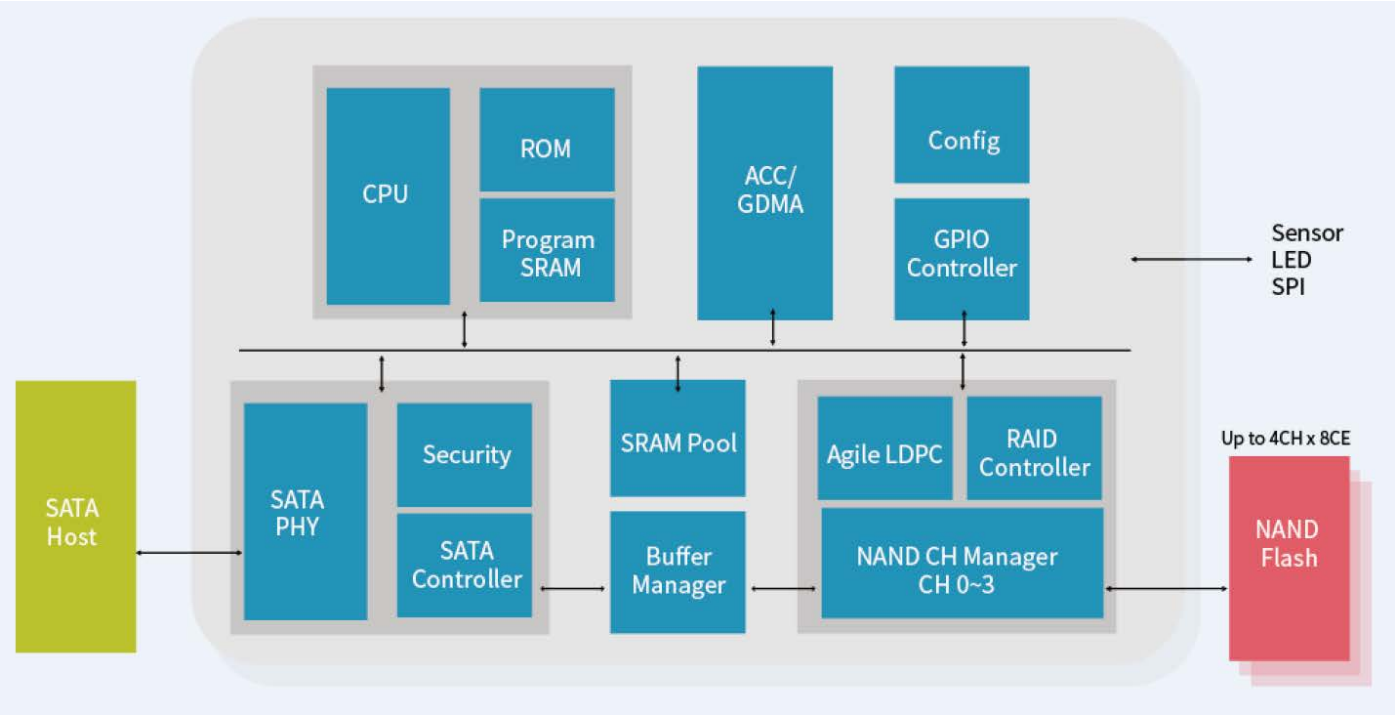
1.0 General Description

The YTY UNiCORE UM28S3TNN industrial-grade M.2 2280 solid state drive utilizes 3D NAND flash to provide improved power efficiency and rugged reliability. It sports read/write speeds of up to 560/520MB per second, and with support for LDPC ECC technology, it can safeguard data integrity and maintain high performance.

The YTY UNiCORE SSD validation process ensures quality, compatibility, and reliability with functionality testing and reliability assurance.

1.1 Functional Block

Figure 1-1 Functional Block



2.0 Mechanical Specifications

All product specifications not covered in this document (electrical performance, appearance, etc.) are in accordance with YTY UNiCORE's defined norms and standards.

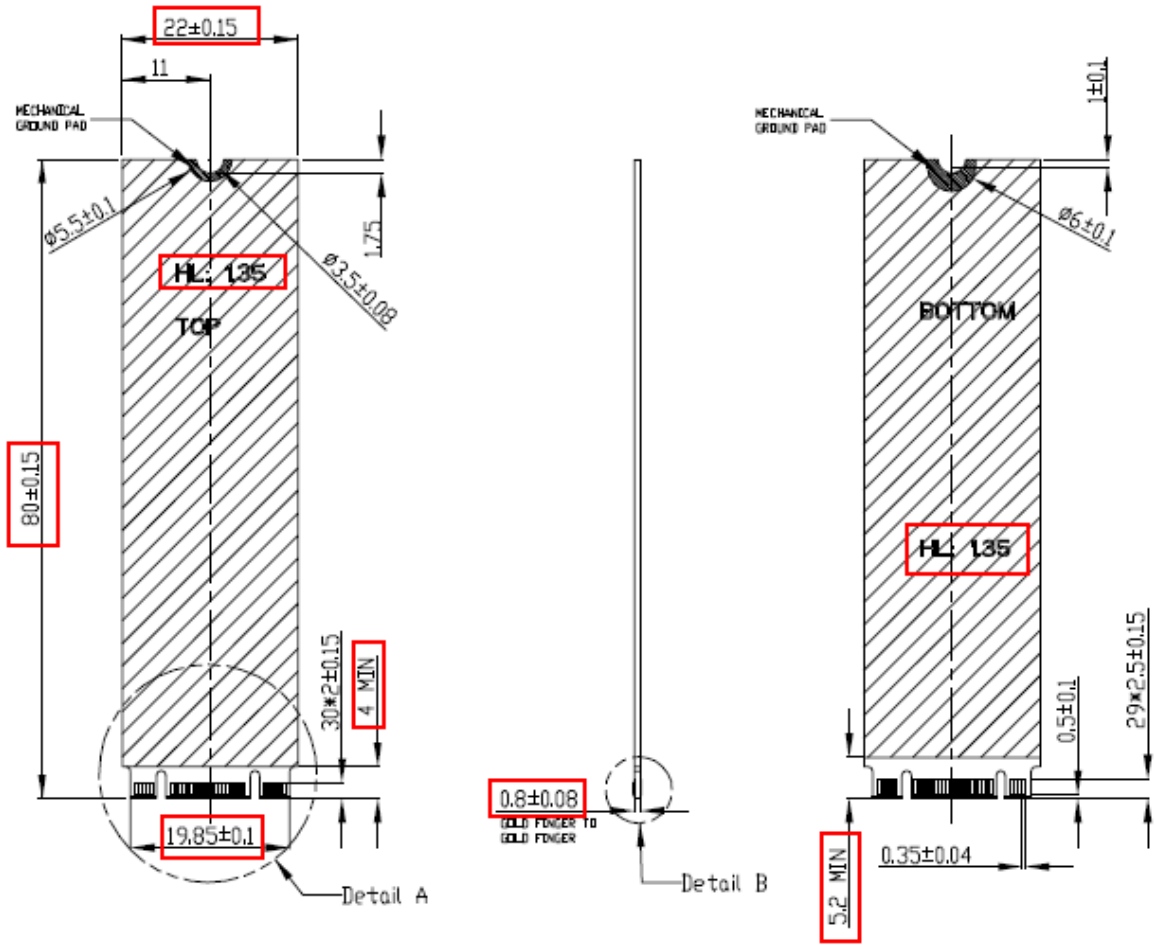
2.1 Physical Dimensions and Weights

Table 2-1 Dimensions and Weights

Capacity(GB)	Length(mm)	Width(mm)	Height(mm)	Weight(gram)
128	80±0.15	22±0.15	Max 3.6	Max 6±1g
256	80±0.15	22±0.15	Max 3.6	Max 6±1g
512	80±0.15	22±0.15	Max 3.6	Max 6±1g
1024	80±0.15	22±0.15	Max 3.6	Max 6±1g
2048	80±0.15	22±0.15	Max 3.6	Max 6±1g

2.2 Product Dimensions

Figure 2-1 Product Dimensions



3.0 Product Specifications

3.1 Interface and Configurations

- Compliant with Serial ATA International Organization: Serial ATA revision 3.1
- Compliant with SSD Alliance compliance program
- Support ATA-8 Command Set
- Support 1-port 1.5/3.0/6.0 Gbps SATA I/II/III interface

3.2 Capacity

Table 3-1 User Addressable Sectors

Model	UM28S3TNN				
Unformatted Capacity	128GB	256GB	512GB	1TB	2TB
Total User Addressable Sectors (LBA Mode)	250,069,680	500,118,192	1,000,215,216	2,000,409,264	4,000,797,360

Total useable capacity may be less (duo to formatting, flash management, and other functions).
1GB=1,000,000,000 bytes; 1sector = 512bytes.

3.3 Performance

3.3.1 ATTO Performance

Table 3-2 Read/Write Performance (ATTO)

	128GB	256GB	512GB	1TB	2TB	Unit
Sequential Read	520	560	560	560	560	MB/s
Sequential Write	330	500	510	520	520	MB/s

-Seq. Read & Write speed test by ATTO
-The system conditions and test environment may affect test result

3.3.2 CDM Performance

Table 3-3 Read/Write Performance (CDM)

	128GB	256GB	512GB	1TB	2TB	Unit
Sequential Q32 Read	520	560	560	560	560	MB/s
Sequential Q32 Write	330	500	510	520	520	MB/s

-Seq. Read & Write speed test by Crystal Disk Mark 5.1.2

3.3.3 IOPS Performance

Table 3-4 Read/Write & IOPS Performance

	128GB	256GB	512GB	1TB	2TB	Unit
4K Random Read	41K	72K	95K	95K	95K	IOPS
4K Random Write	54K	67K	68K	67K	66K	IOPS

-Seq. Read & Write speed test by IOmeter 2010 with “00” pattern (Queue depth of 32; Measurements are performed on 10% capacity of LBA range. Write cache enable)
-IOPS Test Utility: IOmeter 2010 (Queue depth of 32; Measurements are performed on 10% capacity of LBA range. Write cache enable)
-The system conditions and test environment may affect test result

3.3.4 AS-SSD Performance

Table 3-5 Read/Write Performance (AS-SSD)

	128GB	256GB	512GB	1TB	2TB	Unit
Sequential Read	490	520	520	520	520	MB/s
Sequential Write	320	460	470	480	480	MB/s
4K-64 Thrd Read	89	150	220	230	230	MB/s
4K-64 Thrd Write	270	280	280	280	280	MB/s

Seq. Read & Write speed test by AS-SSD with Random pattern

3.4 Electrical Specifications

3.4.1 Operating Voltage

Table 3-6 Operating Voltage

Operating Voltage	
Input Power	DC 3.3V ± 5%
Maximum Allowable Ripple	100mV p-p

3.4.2 Power Consumption

Table 3-7 Power Consumption (Typical)

	128GB	256GB	512GB	1TB	2TB	Unit
Device Sleep	3	3	3	3	3	**mW**
Slumber	0.06	0.06	0.06	0.067	**0.056**	**W**
Idle	0.684	0.684	0.684	0.684	0.694	
Sequential Read	0.973	1.262	1.378	1.497	1.603	
Sequential Write	0.947	1.17	1.159	1.162	1.265	
Random Read	0.957	1.216	1.114	1.194	1.297	
Random Write	0.955	0.999	0.933	0.984	1.048	

- The typical value means to measure the power consumption by using IO Meter with 128KB Sequential and 4K Random read/write transfers within 15 minutes.
- The measurement may vary among different host systems and settings.

3.5 Environmental Conditions

Table 3-8 Temperature and Humidity

Feature	Operating	Non-Operating
Industrial Temperature	-40°C to 85°C	-55°C to 95°C
Humidity	5%~95% RH, non-condensing	

3.6 Reliability

Table 3-9 Shock and Vibration

Parameter	Conditions	Reference Standards
Shock	1500G, 3 axes, duration 0.5ms, Half Sine Wave	JESD22-B110
Vibration	20G , 3 axes , Peak, 20~2000Hz	JESD22-B103

Table 3-10 MTBF

Parameter	Conditions	Hours
MTBF	MIL-HDBK-217	3,000,000

3.7 Endurance

SSD endurance can be predicted based on the operating workload. The table below shows the drive lifetime for each SSD capacity based JESD219 client workload.

Table 3-11 Terabytes Written

Capacity	128GB	256GB	512GB	1TB	2TB	Unit
TBW	150	300	600	1200	2400	TB

4.0 Support Command Sets

4.1 Identify Device Command

IDENTIFY DEVICE (ECh). These commands read out 512Bytes of drive parameter information. Parameter Information consists of the arrangement and value as shown in the following table. This command enables the host to receive the Identify Drive Information from the device.

Table 4-1 Identify Device Table

Word	Value	F/V/X	Description
0	0040h	F	General configuration bit-significant information:
		X	15 0 = ATA device
		F	14-8 Retired
		X	7:6 Obsolete
		X	5-3 Retired
		F	2 Response incomplete
		X	1 Retired
		F	0 Reserved
1	XXXXh	X	Obsolete
2	C837h	V	Specific configuration
3	XXXXh	X	Obsolete
4-5	XXXXh	X	Retired
6	XXXXh	X	Obsolete
7-8	XXXXh	V	Reserved for the Compact Flash Association
9	XXXXh	X	Retired
10-19	XXXXh	F	Serial number
20-21	XXXXh	X	Retired
22	XXXXh	X	Obsolete
23-26	XXXXh	F	Firmware revision (8 ASCII characters)
27-46	XXXXh	F	Model number (40 ASCII characters)
47	80XXh	F	Capabilities
		F	15-8 80h
		F	7-0 00h = Reserved 01h-FFh = Maximum number of logical sectors that shall be transferred per DRQ data block on READ/WRITE MULTIPLE commands
48	4000h	F	Trusted Computing feature set options
	0		15 Shall be cleared to zero
	1		14 Shall be set to one
	0000		13:1 Reserved for the Trusted Computing Group
	0		0 1=Trusted Computing feature set is supported
49	2F00h	F	Capabilities

	0	F	15:14 Reserved for the IDENTIFY PACKET DEVICE command
	1	F	13 1 = Standby timer values as specified in this standard are supported
			0 = Standby timer values shall be managed by the device
	0	F	12 Reserved for the IDENTIFY PACKET DEVICE command
	1	F	11 1 = IORDY supported
			0 = IORDY may be supported
	1	F	10 1 = IORDY may be disabled
	1	F	9 1 = LBA is supported
	1	F	8 1 = DMA supported
	00	X	7:2 Reserved
	0	F	1:0 Current Long Physical Sector Alignment setting
50	4000h	F	Capabilities
	0	F	15 Shall be cleared to zero
	1	F	14 Shall be set to one
	000	X	13:2 Reserved
	0	X	1 Obsolete
	0	F	0 Vendor specific Standby timer value minimum
51-52	0000h	X	Obsolete
53	0007h		Field Validity
	00	F	15:8 Free-fall Control Sensitivity
			00h = Vendor's recommended setting
			01h-FFh = Sensitivity level
	00	X	7:3 Reserved
	1	F	2 1 = Word 88 are valid
	1	F	1 1 = Word 70:64 are valid
	1	F	0 Obsolete
54-58	XXXXh	X	Obsolete
59	9DXXh		Capabilities
	1	F	15 1 = BLOCK ERASE EXT command is supported
	0	F	14 1 = OVERWRITE EXT command is supported
	0	F	13 1 = CRYPTO SCRAMBLE EXT command is supported
	1	F	12 1 = Sanitize feature set is supported
	6	F	11:9 Reserved
	1	V	8 1 = Multiple logical sector setting is valid
	XX	V	7:0 Current setting for number of logical sectors
60-61	XXXXh	F	Total number of user addressable logical sectors
62	0000h	X	Obsolete
63	0007h		Multiword DMA transfer
	00	F	15:11 Reserved

	0	V	10 1 = Multiword DMA mode 2 is selected
	0	V	9 1 = Multiword DMA mode 1 is selected
	0	V	8 1 = Multiword DMA mode 0 is selected
	00	X	7:3 Reserved
	1	F	2 1 = Multiword DMA mode 2 and below are supported
	1	F	1 1 = Multiword DMA mode 1 and below are supported
	1	F	0 1 = Multiword DMA mode 0 is supported
64	0003h		PIO transfer mode
	0000	F	15:2 Reserved
	3	F	1:0 PIO modes supported
65	0078h		Minimum Multiword DMA transfer cycle time per word
		F	15:0 Cycle time in nanoseconds
66	0078h		Manufacturer's recommended Multiword DMA transfer cycle time
		F	15:0 Cycle time in nanoseconds
67	0078h		Minimum PIO transfer cycle time without flow control
		F	15:0 Cycle time in nanoseconds
68	0078h		Minimum PIO transfer cycle time with IORDY flow control
		F	15:0 Cycle time in nanoseconds
69	4020h	X	Additional Supported
	0		15 1 = CFast Specification Support
	1		14 1 = Deterministic data in trimmed LBA range(s) is supported
	0		13 1 = Long Physical Sector Alignment Error Reporting Control is supported
	0		12 Obsolete
	0		11 1 = READ BUFFER DMA is supported
	0		10 1 = WRITE BUFFER DMA is supported
	0		9 1 = SET MAX SET PASSWORD DMA and SET MAX UNLOCK DMA are supported
	0		8 1 = DOWNLOAD MICROCODE DMA is supported
	0		7 Reserved for IEEE 1667
	0		6 0 = Optional ATA device 28-bit commands supported
	1		5 1 = Trimmed LBA range(s) returning zeroed data is supported
	0		4 1 = Device Encrypts All User Data
	0		3 1 = Extended Number of User Addressable Sectors is supported
	0		2 1 = All write cache is non-volatile
	0		1:0 Reserved
70	0000h	F	Reserved
71-74	0000h	F	Reserved for the IDENTIFY PACKET DEVICE command
75	001Fh		Queue depth
	000	F	15:5 Reserved

	1F	F	4:0 Maximum queue depth - 1
76	XXXXh	X	Serial ATA Capabilities
	1		15 1 = Supports READ LOG DMA EXT as equivalent to READ LOG EXT
	X		14 1 = Supports Device Automatic Partial to Slumber transitions
	0		13 1 = Supports Host Automatic Partial to Slumber transitions
	0		12 1 = Supports NCQ priority information
	0		11 1 = Supports Unload while NCQ commands are outstanding
	1		10 1 = Supports the SATA Phy Event Counters log
	X		9 1 = Supports receipt of host initiated power management requests(HIPM)
	1		8 1 = Supports the NCQ feature set
	0		7:4 Reserved for Serial ATA
	1		3 1 = Supports SATA Gen3 Signaling Speed (6.0Gb/s)
	1		2 1 = Supports SATA Gen2 Signaling Speed (3.0Gb/s)
	1		1 1 = Supports SATA Gen1 Signaling Speed (1.5Gb/s)
	0		0 Shall be cleared to zero
77	0002h	X	Serial ATA Additional Capabilities
	000	X	15:7 Reserved for Serial ATA
	0	X	6 1 = Supports RECEIVE FPDMA QUEUED and SEND FPDMA QUEUED commands
	0	X	5 1 = Supports NCQ Queue Management Command
	0	X	4 1 = Supports NCQ Streaming
	1	X	3:1 Serial ATA signal speed (01:Gen1, 02:Gen2, 03:Gen3)
	0	F	0 Shall be cleared to zero
78	014Ch	X	Serial ATA features supported
	00	X	15:9 Reserved for Serial ATA
	1	X	8 1 = Device Sleep supported
	0	X	7 1 = Device supports NCQ Autosense
	1	X	6 1 = Device supports Software Settings Preservation
	0	X	5 Reserved for Serial ATA
	0	X	4 1 = Device supports in-order data delivery
	1	X	3 1 = Device supports initiating power management(DIPM)
	1	X	2 1 = Device supports DMA Setup auto-activation
	0	X	1 1 = Device supports non-zero buffer offsets
	0	F	0 Shall be cleared to zero
79	0040h		Serial ATA features enabled
	00		15:9 Reserved for Serial ATA
	0		8 1 = Device Sleep enabled
	0		7 1 = Automatic Partial to Slumber transitions enabled
	1		6 1 = Software Settings Preservation enabled

	0		5 Reserved for Serial ATA
	0		4 1 = In-order data delivery enabled
	0		3 1 = Device initiated power management enabled(DIPM)
	0		2 1 = DMA Setup auto-activation enabled
	0		1 1 = Non-zero buffer offsets enabled
	0		0 Shall be cleared to zero
80	XXXXh		Major version number
			0000h or FFFFh = device does not report version
	XX	F	15:11 Reserved
	X	F	10 1 = supports ACS-3
	1	F	9 1 = supports ACS-2
	1	F	8 1 = supports ATA8-ACS
	1	F	7 1 = supports ATA/ATAPI-7
	1	F	6 1 = supports ATA/ATAPI-6
	1	X	5 1 = supports ATA/ATAPI-5
	C	X	4:1 Obsolete
	0	F	0 Reserved
81	0000h	V	Minor version number
82	706Bh	X	Commands and feature sets supported
	0		15 Obsolete
	1		14 1 = NOP command is supported
	1		13 1 = READ BUFFER command is supported
	1		12 1 = WRITE BUFFER command is supported
	0		11:10 Obsolete
	0		9 1 = DEVICE RESET command is supported
	0		8:7 Obsolete
	1		6 1 = Read look-ahead is supported
	1		5 1 = Volatile write cache is supported
	0		4 1 = PACKET feature set is supported
	1		3 1 = Power Management feature set is supported
	0		2 Obsolete
	1		1 1 = Security feature set is supported
	1		0 1 = SMART feature set is supported
83	7401h	X	Commands and feature sets supported
	0		15 Shall be cleared to zero
	1		14 Shall be set to one
	1		13 1 = FLUSH CACHE EXT command is supported
	1		12 1 = Mandatory FLUSH CACHE command is supported
	0		11 Obsolete
	1		10 1 = 48-bit Address feature set is supported

	0		9:8 Obsolete
	0		7 Reserved for the Address Offset Reserved Area Boot Method
	0		6 1 = SET FEATURES subcommand is required to spin-up after power-up
	0		5 1 = PUIS feature set is supported
	0		4 Obsolete
	0		3 1 = APM feature set is supported
	0		2 1 = CFA feature set is supported
	0		1 Obsolete
	1		0 1 = DOWNLOAD MICROCODE command is supported
84	4161h	X	Commands and feature sets supported
	0		15 Shall be cleared to zero
	1		14 Shall be set to one
	0		13 IDLE IMMEDIATE command with UNLOAD feature is supported
	0		12 Reserved for TLC
	0		11 Reserved for TLC
	0		10:9 Obsolete
	1		8 1 = 64-bit world wide name is supported
	0		7 Obsolete
	1		6 1 = WRITE DMA FUA EXT and WRITE MULTIPLE FUA EXT commands are supported
	1		5 1 = GPL feature set is supported
	0		4 1 = Streaming feature set is supported
	0		3 Obsolete
	0		2 1 = Media serial number is supported
	0		1 1 = SMART self-test is supported
	1		0 1 = SMART error logging is supported
85	7069h	X	Commands and feature sets supported or enabled
	0		15 Obsolete
	1		14 1 = NOP command is supported
	1		13 1 = READ BUFFER command is supported
	1		12 1 = WRITE BUFFER command is supported
	0		11:10 Obsolete
	0		9 1 = DEVICE RESET command is supported
	0		8 1 = SERVICE interrupt is enabled
	0		7 1 = Release interrupt is enabled
	1		6 1 = Read look-ahead is enabled
	1		5 1 = Volatile write cache is enabled
	0		4 1 = PACKET feature set is supported
	1		3 1 = Mandatory Power Management feature set is supported

	0		2 Obsolete
	0		1 1 = Security feature set is enabled
	1		0 1 = SMART feature set is enabled
86	B401h	X	Commands and feature sets supported or enabled
	1		15 1 = Words 119-120 are valid
	0		14 Reserved
	1		13 1 = FLUSH CACHE EXT command supported
	1		12 1 = FLUSH CACHE command supported
	0		11 Obsolete
	1		10 1 = 48-bit Address features set is supported
	0		9:8 Obsolete
	0		7 1 = Reserved for Address Offset Reserved Area Boot Method
	0		6 1 = SET FEATURES subcommand is required to spin-up after power-up
	0		5 1 = PUIS feature set is enabled
	0		4 Obsolete
	0		3 1 = APM feature set is enabled
	0		2 1 = CFA feature set is supported
	0		1 Obsolete
	1		0 1 = DOWNLOAD MICROCODE command is supported
87	4161h	X	Commands and feature sets supported or enabled
	0		15 Shall be cleared to zero
	1		14 Shall be set to one
	0		13 1 = IDLE IMMEDIATE command with UNLOAD FEATURE is supported
	0		12 Reserved for TLC
	0		11 Reserved for TLC
	0		10:9 Obsolete
	1		8 1 = 64-bit world wide name is supported
	0		7 Obsolete
	1		6 1 = WRITE DMA FUA EXT and WRITE MULTIPLE FUA EXT commands are supported
	1		5 1 = GPL feature set is supported
	0		4:3 Obsolete
	0		2 1 = Media serial number is valid
	0		1 1 = SMART self-test supported
	1		0 1 = SMART error logging is supported
88	407Fh	X	Ultra DMA modes
	0	X	15 Reserved
	1	V	14 1 = Ultra DMA mode 6 is selected
	0	V	13 1 = Ultra DMA mode 5 is selected

	0	V	12 1 = Ultra DMA mode 4 is selected
	0	V	11 1 = Ultra DMA mode 3 is selected
	0	V	10 1 = Ultra DMA mode 2 is selected
	0	V	9 1 = Ultra DMA mode 1 is selected
	0	V	8 1 = Ultra DMA mode 0 is selected
	0	X	7 Reserved
	1	F	6 1 = Ultra DMA mode 6 and below are supported
	1	F	5 1 = Ultra DMA mode 5 and below are supported
	1	F	4 1 = Ultra DMA mode 4 and below are supported
	1	F	3 1 = Ultra DMA mode 3 and below are supported
	1	F	2 1 = Ultra DMA mode 2 and below are supported
	1	F	1 1 = Ultra DMA mode 1 and below are supported
	1	F	0 1 = Ultra DMA mode 0 is supported
89	0001h	F	Time required for security erase unit completion
	0		15 1 = Extended Time is reported in bits 14:0
			0 = Extended Time is reported in bits 7:0
	00		14:8 Extended Time required for Normal Erase mode
	01		7:0 Extended Time required for Normal Erase mode
90	0001h	F	Time required for Enhanced security erase completion
	0		15 1 = Extended Time is reported in bits 14:0
			0 = Extended Time is reported in bits 7:0
	00		14:8 Extended Time required for Enhanced Erase mode
	01		7:0 Extended Time required for Enhanced Erase mode
91	0000h	V	Advanced Power Management Level
	00		15:8 Reserved
	00		7:0 Current APM level value
92	FFFEh	V	Master Password Identifier
93	0000h	X	Hardware reset result
	0		15 Shall be cleared to zero
	0		14 Shall be set to one
	0		13 1 = device detected the CBLID- above
			0 = device detected the CBLID- below
	00		12:8 Device 1 hardware reset result
	00		7:0 Device 0 hardware reset result
94	0000h	V	Obsolete
95	0000h	V	Stream Minimum Request Size
96	0000h	V	Streaming Transfer Time - DMA
97	0000h	V	Streaming Access Latency - DMA and PIO
98-99	0000h	V	Streaming Performance Granularity
100-103	Xh	V	Number of User Addressable Logical Sectors

104	0000h	V	Streaming Transfer Time - PIO
105	0008h	V	Maximum number of 512-byte blocks per DATA SET MANAGEMENT command
106	4000h		Physical sector size / logical sector size
	0		15 Shall be cleared to zero
	1		14 Shall be set to one
	0		13 1 = Device has multiple logical sectors per physical sector
	0		12 1 = Device Logical Sector longer than 256 Words
	00		11:4 Reserved
	0		3:0 2^logical sectors per physical sector
107	0000h		Inter-seek delay for ISO 7779 standard acoustic testing
108-111	Xh	V	World wide name
112-115	Xh	X	Reserved
116	0000h	X	Reserved for TLC
117-118	Xh	X	Logical sector size
119	4XXC		Commands and feature sets supported
	0		15 Shall be cleared to zero
	1		14 Shall be set to one
	XX		13:8 Reserved
	0		7 1 = Extended Power Conditions feature set is supported
	X		6 1 = Sense Data Reporting feature set is supported
	0		5 1 = Free-fall Control feature set is supported
	1		4 1 = Download Microcode mode 3 is supported
	1		3 1 = READ LOG DMA EXT and WRITE LOG DMA EXT commands are supported
	1		2 1 = WRITE UNCORRECTABLE EXT command is supported
	0		1 1 = Write-Read-Verify feature set is supported
	0		0 Reserved for DDT
120	401C		Commands and feature sets supported or enabled
	0		15 Shall be cleared to zero
	1		14 Shall be set to one
	00		13:8 Reserved
	0		7 1 = Extended Power Conditions feature set is enabled
	0		6 1 = Sense Data Reporting feature set is enabled
	0		5 1 = Free-fall Control feature set is enabled
	1		4 1 = Download Microcode mode 3 is supported
	1		3 1 = READ LOG DMA EXT and WRITE LOG DMA EXT commands are supported
	1		2 1 = WRITE UNCORRECTABLE EXT command is supported
	0		1 1 = Write-Read-Verify feature set is enabled
	0		0 Reserved for DDT

121-126	0h	X	Reserved for expanded supported and enabled settings
127	0000h	F	Obsolete
128	0021h	V	Security status
	00		15-9 Reserved
	0		8 Master Password Capability: 0 = High, 1 = Maximum
	0		7-6 Reserved
	1		5 1 = Enhanced security erase supported
	0		4 1 = Security count expired
	0		3 1 = Security frozen
	0		2 1 = Security locked
	0		1 1 = Security enabled
	1		0 1 = Security supported
129-159	Xh	X	Vendor specific
160	0000h	X	CFA power mode
	0		15 Word 160 supported
	0		14 Reserved
	0		13 CFA power mode 1 is required for one or more commands implemented by the device
	0		12 CFA power mode 1 disabled
	000		11:0 Maximum current in mA
161-167	Xh	X	Reserved for the CompactFlash Association
168	0003h		Device Nominal Form Factor
	000		15:4 Reserved
	3		3:0 Device Nominal Form Factor
169	0001		DATA SET MANAGEMENT command is supported
	0000		15:1 Reserved
	1		0 1 = Trim bit in the DATA SET MANAGEMENT command is supported
170-173	Xh	X	Additional Product Identifier
174-175	Xh	X	Reserved
176-205	Xh	V	Current media serial number
206	Xh	X	SCT Command Transport
	0		15:12 Vendor Specific
	0		11:8 Reserved
	0		7 Reserved for Serial ATA
	0		6 Reserved
	1		5 1 = SCT Data Tables command is supported
	1		4 1 = SCT Feature Control command is supported
	X		3 1 = SCT Error Recovery Control command is supported
	0		2 1 = SCT Write Same command is supported

	0 1		1 Obsolete 0 1 = SCT Command Transport is supported
207-208	Xh	X	Reserved
209	4000h 0 1 0000		Alignment of logical blocks within a physical block 15 Shall be cleared to zero 14 Shall be set to one 13:0 Logical sector offset within the first physical sector where the first logical sector is placed
210-211	0h	V	Write-Read-Verify Sector Count Mode 3
212-213	0h	V	Write-Read-Verify Sector Count Mode 2
214-216	0h	X	Obsolete
217	0001h	V	Nominal media rotation rate
220	0000h 00 00	V	Write-Read-Verify feature 15:8 Reserved 7:0 Write-Read-Verify feature set current mode
221	0000h	X	Reserved
222	10FFh 1 03 1 1 1 1 1 1	X	Transport major version number 15:12 Transport Type (0:Parallel, 1:Serial, 2-F:Reserved) 11:6 Parallel = Reserved / Serial = Reserved 5 Parallel = Reserved / Serial = SATA Rev 3.0 4 Parallel = Reserved / Serial = SATA Rev 2.6 3 Parallel = Reserved / Serial = SATA Rev 2.5 2 Parallel = Reserved / Serial = SATA II Extensions 1 Parallel = ATA/ATAPI-7 / Serial = SATA 1.0a 0 Parallel = ATA8-APT / Serial = ATA8-AST
223	0000h	X	Transport minor version number
224-229	Xh	X	Reserved
230-233	Xh	X	Extended Number of User Addressable Sectors
234	XXXXh	X	Minimum number of 512-byte data blocks per Download Microcode mode 03h operation
235	03E8	X	Maximum number of 512-byte data blocks per Download Microcode mode 03h operation
236-254	Xh	X	Reserved
255	XXXXh	X	Integrity word 15-8 Checksum 7-0 Checksum Validity Indicator

Notes:

F/V = Fixed/variable content.

F = the content of the word is fixed and does not change. For removable media devices, these values may change when media is removed or changed.

V = the contents of the word is variable and may change depending on the state of the device or the commands executed by the device.

X = the content of the word may be fixed or variable.

4.2 S.M.A.R.T. Attribute

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

Table 4-2 S.M.A.R.T. Attribute

ID (Dec)	ID (Hex)	Attribute Description	Flag	Threshold
9	09h	Power-On Hours Count	12h	00h (N/A)
12	0Ch	Drive Power Cycle Count	12h	00h (N/A)
167	A7h	SSD Protect Mode	22h	00h (N/A)
168	A8h	PHY Error Count	12h	00h (N/A)
169	A9h	Bad Block Count	13h	0Ah
173	ADh	Erase Count	12h	00h (N/A)
175	AFh	Bad Cluster Table Count	13h	0Ah
180	B4h	User Block Count Left	33h	14h
192	C0h	Unexpected Power Loss Count	12h	00h (N/A)
194	C2h	Temperature	22h	1Eh
231	E7h	SSD Life Left	33h	05h
233	E9h	Write Sector Count to NAND	32h	00h (N/A)
234	EAh	Read Sector Count from NAND	32h	00h (N/A)
241	F1h	Write Sector Count	32h	00h (N/A)
242	F2h	Read Sector Count	32h	00h (N/A)

5.0 Pin Assignment and Descriptions

Table 5-1 Pin assignment and descriptions

Top Side			Bottom Side		
No.	Pin	Descriptions	Descriptions	Pin	No
75	GND	System Ground			
73	GND	System Ground	3.3V	POWER	74
71	GND	System Ground	3.3V	POWER	72
69	GND	System Ground	3.3V	POWER	70
67	NC	NC	3.3V	POWER	68
Module-KEY					
57	GND	System Ground	MFG_CLK	UART	58
55	NC	NC	MFG_DATA	UART	56
53	NC	NC	NC	NC	54
51	GND	System Ground	NC	NC	52
49	Diff	SATA-A+	NC	NC	50
47	Diff	SATA-A-	NC	NC	48
45	GND	System Ground	NC	NC	46
43	Diff	SATA-B-	NC	NC	44
41	Diff	SATA-B+	NC	NC	42
39	GND	System Ground	NC	NC	40
37	NC	NC	DEVSLP	DEVSLP	38
35	NC	NC	NC	NC	36
33	GND	System Ground	NC	NC	34
31	NC	NC	NC	NC	32
29	NC	NC	NC	NC	30
27	GND	System Ground	NC	NC	28
25	NC	NC	NC	NC	26
23	NC	NC	NC	NC	24
21	GND	System Ground	NC	NC	22
			NC	NC	20
Module-KEY					
11	NC	NC			
9	NC	NC	LED1#(option)	INDICATE	10
7	NC	NC	NC	NC	8
5	NC	NC	NC	NC	6
3	GND	System Ground	3.3V	POWER	4
1	GND	System Ground	3.3V	POWER	2

6.0 Ordering Information

Table 6-1 Ordering Information

Model Name	Capacity	P/E cycles	Type	Remark
UM28S3TNN-128GWM25	128GB	3K	M.2 2280 SATA	-40℃~85℃
UM28S3TNN-256GWM25	256GB	3K	M.2 2280 SATA	
UM28S3TNN-512GWM25	512GB	3K	M.2 2280 SATA	
UM28S3TNN-001TWM25	1TB	3K	M.2 2280 SATA	
UM28S3TNN-002TWM25	2TB	3K	M.2 2280 SATA	

7.0 Package Specification

Figure 7-1 Package Specification