

# Digitization comes to life



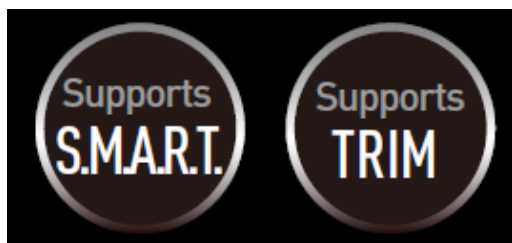
## TEAM SSD SERIES

Team's Solid State Disk ( SSD ) is break-through product promising faster booting time, low power consumption , zero noise , shock resistance and light weight. The SSD uses a random access mechanism, which is superior to semi-progressive, and semi-random access of conventional hard drives. This can help to enhance program execution and data read/write speeds; the SSD is a favorable option for system using Windows Vista.

TEAMGROUP *Team*

# Team Solid State Disk

## M.2 PCIe SSD P30



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- **Revision Histories**

**Documentation Revise History:**

<b>Version</b>	<b>Revision Description</b>	<b>Date</b>	<b>Remark</b>
<b>A.0</b>	<b>Initial Release</b>	<b>16-MAY-2017</b>	<b>Steve Lin</b>

TEAM GROUP INC.

Item	Specification
<b>Model</b>	P30
<b>Interface</b>	PCIe 3.0 x4 with NVMe 1.2
<b>Capacity</b>	240 / 480 GB*
<b>Voltage</b>	DC +3.3V
<b>Operating Temperature</b>	0°C to 70°C
<b>Storage Temperature</b>	-40°C to 85°C
<b>Terabyte Written</b>	240 / 335 TB ; 480 / 670 TB
<b>Performance</b>	Crystal Disk Mark: 240GB Read/Write: up to 2500 / 1300 MB/s* 480GB Read/Write: up to 2500 / 1350 MB/s* IOPS: 240GB/480GB Read/Write: 180K / 140K IOPS Max*
<b>Weight</b>	16g
<b>Dimensions</b>	80.00 (L) x 22.00 (W) x 3.10 (H) mm
<b>Humidity</b>	RH 90% under 40°C (operational)
<b>Vibration</b>	80Hz ~ 2,000 Hz / 20G
<b>Shock</b>	1500 G / 0.5 m/sec
<b>MTBF</b>	2,000,000 hours
<b>Operation System</b>	1. System Requirements: <ul style="list-style-type: none"> <li>Windows 10, Windows 8, Windows 7, Windows Vista</li> <li>Linux 2.6.33 or later</li> </ul> 2. This product has a heat sink, recommended the use of desktop or gaming NB and non-ultra-thin notebook to use.
<b>Warranty</b>	3-year limited warranty
<p>*1GB=1,000,000,000 Bytes. In OS system, it would be displayed as 1,000,000,000 Bytes/1024/1024/1024 = 0.93GB.</p> <p>**Transmission speed will vary according to different hardware / software conditions, therefore the data can only used for basic reference.</p> <p>※We reserve the right to modify product specifications without prior notice.</p>	

## 1. General Description

The Team Group now releases M.2 PCIe SSD - P30. P30 supports the new generation PCIe Gen3 x4 high speed interface and the latest NVMe specification. Besides its powerful superior read/write speed, with its outstanding performance of sequential read/write speed up to 2500/1350 MB/s, and random read/write speed up to 180K/140K IOPS, it is still able to reduce operating delays of the operating system and game/software, and delivers the finest and smoothest gaming experience and an extreme high speed performance without any lag even reading/writing large amounts of game data, complex 3D graphics and motion processing algorithms with fancy special effects, or loading heavy duty video/graphics editing software.

M.2 PCIe SSD - P30 supports the latest NVMe specification. The system communicates with it through PCIe bus and connects to the built-in PCIe controller of the chipset or processor, so the signal transfer is as simple and precise as point to point. M.2 PCIe SSD - P30 offers you a pleasant high performance transfer experience, without a bit of lag or delay.

The transfer speed of traditional solid state drive is limited within SATA's 6Gb/s bandwidth, therefore consumers have gradually shifted to PCIe interface, which is capable of offering higher transfer speed. Due to this fact, M.2 PCIe SSD - P30 is using PCIe Gen3 x 4 high speed transfer interface. With the support of PCIe bus bandwidth, it can offer consumers a stable transfer speed of at least 1000MB/s, or up to over 2000MB/s. The transfer speed is 4 times higher than SATA 6GB/s interface and allows consumers to enjoy the high speed multimedia entertainment experience.

M.2 PCIe SSD - P30 supports S.M.A.R.T function and its built-in smart algorithm management mechanism has functions such as GC (garbage collection) and TRIM command which are able to ensure operation efficiency, prolong the service life of the SSD and bring it to its maximum performance. Meanwhile, the powerful Wear-Leveling technology and ECC (Error Correction Code) function improve the accuracy and reliability of data transfer.

### ● Main Feature

- Extreme read/write speed – Over 2500MB/s of read speed can enhance the speed and performance of the overall system.
- NVMe interface – Support latest NVMe specification.
- Support S.M.A.R.T. technology – Monitoring hard drive status efficiently.
- Support TRIM – Bring out its best performance on the compatible operating system.
- Product warranty – 3 years product warranty. Free technical support service.

- **Flash Management**

- **Error Correction Code (ECC)**

Flash memory cells will deteriorate with use, which might generate random bit errors in the stored data. Thus, M.2 PCIe SSD - P30 applies the BCH ECC algorithm, which can detect and correct errors occur during read process, ensure data been read correctly, as well as protect data from corruption.

- **Wear Leveling**

NAND flash devices can only undergo a limited number of program/erase cycles, and in most cases, the flash media are not used evenly. If some areas get updated more frequently than others, the lifetime of the device would be reduced significantly. Thus, Wear Leveling is applied to extend the lifespan of NAND Flash by evenly distributing write and erase cycle across the media.

- **Bad Block Management**

Bad blocks are blocks that include one or more invalid bits, and their reliability is not guaranteed. Blocks that are identified and marked as bad by the manufacturer are referred to as “Initial Bad Blocks”. Bad blocks that are developed during the lifespan of the flash are named “Later Bad Blocks”. Implements an efficient bad block management algorithm to detect the factory-produced bad blocks and manages any bad blocks that appear with use. This practice further prevents data being stored into bad blocks and improves the data reliability.

- **TRIM**

TRIM is a feature which helps improve the read/write performance and speed of Solid-State Drives (SSD). Unlike Hard Disk Drives (HDD), SSDs are not able to overwrite existing data, so the available space gradually becomes smaller with each use. With the TRIM command, the operating system can inform the SSD which blocks of data are no longer in use and can be removed permanently. Thus, the SSD will perform the erase action, which prevents unused data from occupying blocks all the time.

- **SMART**

SMART, an acronym for Self-Monitoring, Analysis and Reporting Technology, is an open standard that allows a hard disk drive to automatically detect its health and report potential failures. When a failure is recorded by SMART, users can choose to replace the drive to prevent unexpected outage or data loss. Moreover, SMART can inform users of impending failures while there is still time to perform proactive actions, such as copy data to another device.

- **Over-Provision**

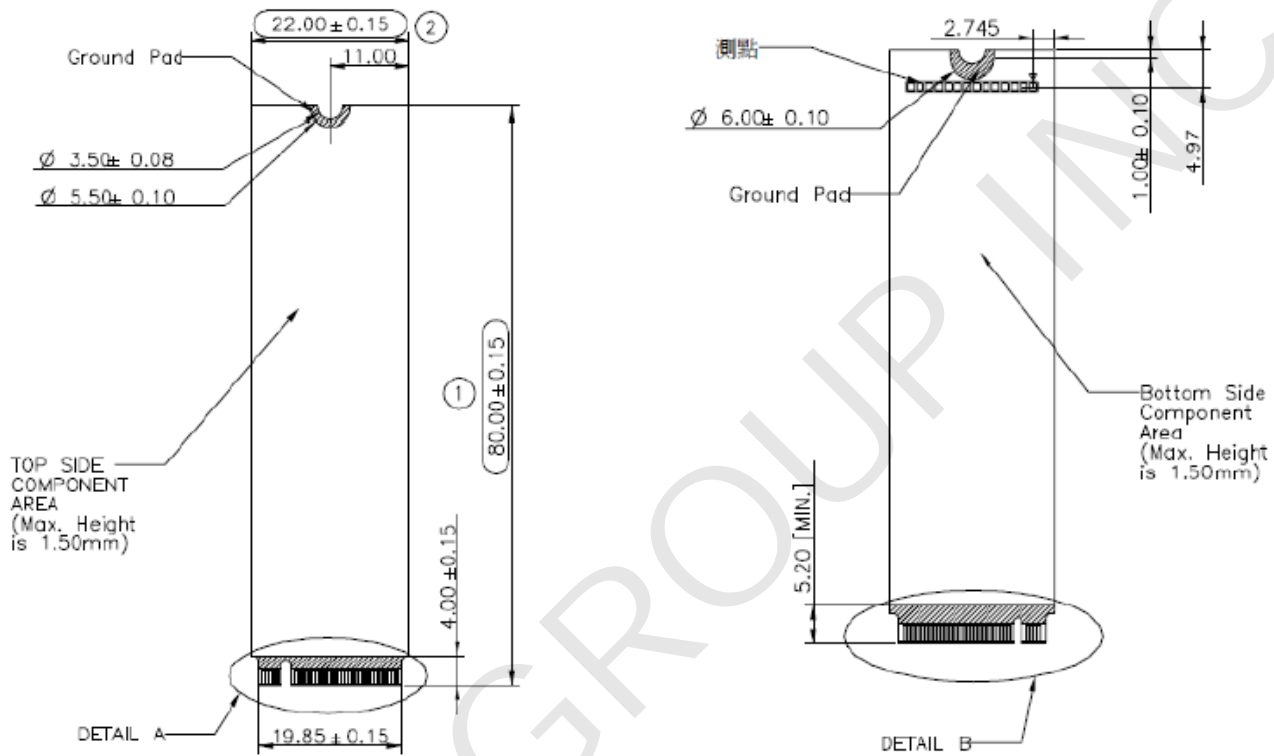
Over Provisioning refers to the inclusion of extra NAND capacity in a SSD, which is not visible and cannot be used by users. With Over Provisioning, the performance and IOPS (Input/output Operations per Second) is improved by providing the controller additional space to manage P/E cycles, which enhances the reliability and endurance as well. Moreover, the write amplification of the SSD becomes lower when the controller writes data to the flash.

## 2. Mechanical Specification

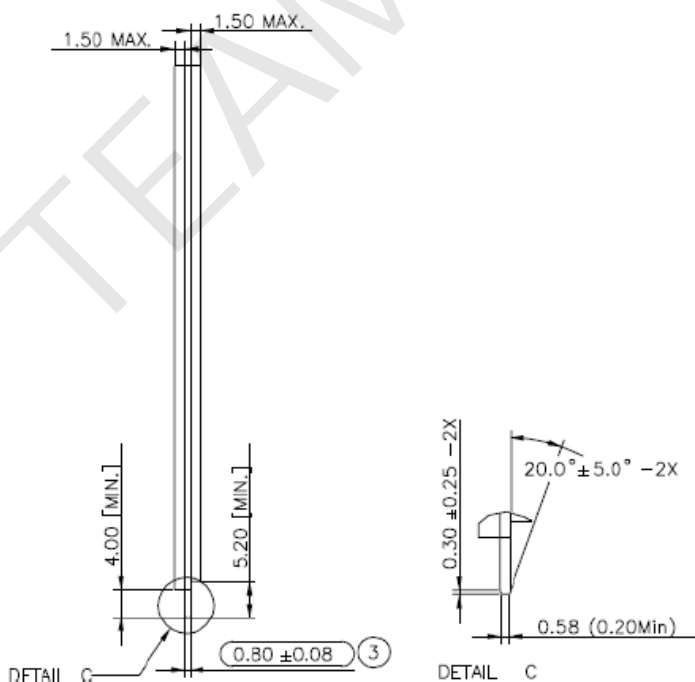
### 2.1 M.2 (PCIe) 2280 Physical dimensions

Model	Height (mm)	Width (mm)	Length (mm)
P30 240GB	3.8 (Max)	22 (+/- 0.2)	80 (+/- 0.2)
P30 480GB	3.8 (Max)	22 (+/- 0.2)	80 (+/- 0.2)

✧ Top & Bottom View:



✧ Side View:





### 3. Product Specification

#### 3.1 Electrical / Physical Interface

- PCIe Interface.
  - Compliant with NVMe 1.2
  - Compatible with PCIe I/II/III x 4 interface
  - Support up to queue depth 64K
  - Support power management
  
- ECC Scheme
  - P30 can correct up to 120 bits error in 2K Byte data.
  
- UART function
- GPIO
- Support SMART and TRIM commands

#### 3.2 Performance

##### 3.2.1 P30 (PCIe 3.0 x4) SSD

Capacity	Flash Type	Sequential (Crystal Disk Mark)		IOPS (Random)	
		Read (MB/s)	Write (MB/s)	Read	Write
240GB	BGA MLC	up to 2500	up to 1300	180K(Max)	140K(Max)
480GB	BGA MLC	up to 2500	up to 1350	180K(Max)*	140K(Max)

Notes:

- a. Performance may differ according to flash configuration and platform.
- b. The table above is for reference only. The criteria and for accepting goods shall be discussed based on different flash configuration.

#### 3.3 TBW (Terabytes Written)

Capacity	TBW
240GB	335
480GB	670

NOTES:

- a. TBW may differ according to flash configuration and platform.
- b. Follow JEDEC 219 pattern to test WAF.
- c. The endurance of SSD could be estimated based on user behavior, NAND endurance cycles, and write amplification factor. It is not guaranteed by flash vendor.

## 4. Environmental Specifications

### 4.1 Temperature and Humidity

- Temperature:
  - Storage: -40°C to 85°C
  - Operational: 0°C to 70°C

- Humidity:

	Temperature	Humidity
Operation	40°C	90% RH
Storage	40°C	90% RH

- Vibration:

	Condition		Vibration Orientation
	Frequency/Displacement	Frequency/Acceleration	
Non-operational	20Hz~80Hz/1.52mm	80Hz~2000Hz/20G	X, Y,Z axis/60 min for each

- Shock:

	Acceleration Force	Half Sin Pulse Duration
Non-operational	1500G	0.5 ms

### 4.2 MTBF

MTBF, an acronym for Mean Time Between Failures, is a measure of device’s reliability. Its value represents the average time between a repair and next failure. The measure is typically in units of hours. The higher the MTBF value, the higher the reliability of the device. The predicted result of is more than 2,000,000 hours.

## 5. Electrical Specification

### 5.1 Supply Voltage

Parameter	Rating
Operation Voltage	3.3V +/- 5%

### 5.2 Power Consumption

Capacity	Read	Write	Idle
240GB	4,890	4,810	400
480GB	5,110	6,920	400

Note:

- a. The average value of power consumption is achieved based on 100% conversion efficiency.
- b. Sequential R/W is measured while testing 1MB sequential R/W 3 times by IOMeter.
- c. Power Consumption may differ according to flash configuration and platform.

## 6. Interface

### 6.1 Pin Assignments and Descriptions

Pin#	PCIe Pin	Description	Pin#	Type	Description
1	GND	Ground	2	3.3V	3.3V source
3	GND	Ground	4	3.3V	3.3V source
5	PETn3	PCIe TX Differential signal defined by the PCI Express M.2 spec	6	N/C	No Connect
7	PETp3	PCIe TX Differential signal defined by the PCI Express M.2 spec	8	N/C	No Connect
9	GND	Ground	10	LED1#(O)	Status indicators via LED devices
11	PERn3	PCIe RX Differential signal defined by the PCI Express M.2 spec	12	3.3V	3.3V source
13	PERp3	PCIe RX Differential signal defined by the PCI Express M.2 spec	14	3.3V	3.3V source
15	GND	Ground	16	3.3V	3.3V source
17	PETn2	PCIe TX Differential signal defined by the PCI Express M.2 spec	18	3.3V	3.3V source
19	PETp2	PCIe TX Differential signal defined by the PCI Express M.2 spec	20	N/C	No Connect
21	GND	Ground	22	N/C	No Connect
23	PERn2	PCIe RX Differential signal defined by the PCI Express M.2 spec	24	N/C	No Connect
25	PERp2	PCIe RX Differential signal defined by the PCI Express M.2 spec	26	N/C	No Connect
27	GND	Ground	28	N/C	No Connect
29	PETn1	PCIe TX Differential signal defined by the PCI Express M.2 spec	30	N/C	No Connect
31	PETp1	PCIe TX Differential signal defined by the PCI Express M.2 spec	32	N/C	No Connect
33	GND	Ground	34	N/C	No Connect
35	PERn1	PCIe RX Differential signal defined by the PCI Express M.2 spec	36	N/C	No Connect
37	PERp1	PCIe RX Differential signal defined by the PCI Express M.2 spec	38	N/C	No Connect
39	GND	Ground	40	N/C	No Connect
41	PETn0	PCIe TX Differential signal defined by the PCI Express M.2 spec	42	N/C	No Connect
43	PETp0	PCIe TX Differential signal defined by the PCI Express M.2 spec	44	N/C	No Connect
45	GND	Ground	46	N/C	No Connect

47	PERn0	PCIe RX Differential signal defined by the PCI Express M.2 spec	48	N/C	No Connect
49	PERp0	PCIe RX Differential signal defined by the PCI Express M.2 spec	50	PERST#(I)(0/3.3V)	PE-Reset is a functional reset to the card as defined by the PCIe Mini CEM specification.
51	GND	Ground	52	CLKREQ#(I/O)(0/3.3V)	Clock Request is a reference clock request signal as defined by the PCIe Mini CEM specification; Also used by L1 PM Substates.
53	REFCLKn	PCIe Reference Clock signals (100 MHz) defined by the PCI Express M.2 spec.	54	PEWAKE#(I/O)(0/3.3V)	PCIe PME Wake. Open Drain with pull up on platform; Active Low.
55	REFCLKp	PCIe Reference Clock signals (100 MHz) defined by the PCI Express M.2 spec.	56	Reserved for MFG DATA	Manufacturing Data line. Used for SSD manufacturing only. Not used in normal operation. Pins should be left N/C in platform Socket.
57	GND	Ground	58	Reserved for MFG CLOCK	Manufacturing Clock line. Used for SSD manufacturing only. Not used in normal operation. Pins should be left N/C in platform Socket.
59	Module Key	Module Key	60	Module Key	Module Key
61	Module Key		62	Module Key	
63	Module Key		64	Module Key	
65	Module Key		66	Module Key	
67	N/C	No Connect	68	SUSCLK (32KHz) (I)(0/3.3V)	32.768 kHz clock supply input that is provided by the platform chipset to reduce power and cost for the module.
69	PEDET (NC-PCIe)	Host I/F Indication; No Connect for PCIe.	70	3.3V	3.3V source
71	N/C	No Connect	72	3.3V	3.3V source
73	N/C	No Connect	74	3.3V	3.3V source
75	GND	Ground			

## 7. Supported Commands

### 7.1 NVMe Command list

<b>Admin Commands</b>	
<b>Opcode</b>	<b>Command Description</b>
00h	Delete I/O Submission Queue
01h	Create I/O Submission Queue
02h	Get Log Page
04h	Delete I/O Completion Queue
05h	Create I/O Completion Queue
06h	Identify
08h	Abort
09h	Set Features
0Ah	Get Features
0Ch	Asynchronous Event Request
10h	Firmware Activate
11h	Firmware Image Download
<b>Admin Commands – NVM Command Set Specific</b>	
80h	Format NVM
81h	Security Send
82h	Security Receive
<b>NVM Commands</b>	
00h	Flush
01h	Write
02h	Read
04h	Write Uncorrectable
05h	Compare
08h	Write Zeroes
09h	Dataset Management

## 8. Identify Device Data

The following table details the sector data returned by the IDENTIFY DEVICE command.

### ● Identify Data Structure

Bytes	O / M	Description	Default Value
01:00	M	PCI Vendor ID (VID)	0x1987
03:02	M	PCI Subsystem Vendor ID (SSVID)	0x1987
23:04	M	Serial Number (SN)	SN
63:24	M	Model Number (MN)	Model Number
71:64	M	Firmware Revision (FR)	FW Name
72	M	Recommended Arbitration Burst (RAB)	0x01
75:73	M	IEEE OUI Identifier (IEEE)	0
76	O	Controller Multi-Path I/O and Namespace Sharing Capabilities (CMIC)	0x00
77	M	Maximum Data Transfer Size (MDTS)	0x09
79:78	M	Controller ID (CNTLID)	0x0000
83:80	M	Version (VER)	0x00010200
87:84	M	RTD3 Resume Latency (RTD3R)	0x00124F80
91:88	M	RTD3 Entry Latency (RTD3E)	0x0016E360
95:92	M	Optional Asynchronous Events Supported (OAES)	0
239:96	-	Reserved	0
255:240	-	Refer to the NVMe Management Interface Specification for definition	0
257:256	M	Optional Admin Command Support (OACS)	0x0007
258	M	Abort Command Limit (ACL)	0x03
259	M	Asynchronous Event Request Limit (AERL)	0x03
260	M	Firmware Updates (FRMW)	0x02
261	M	Log Page Attributes (LPA)	0x03
262	MM	Error Log Page Entries (ELPE)	0x3F
263	M	Number of Power States Support (NPSS)	0x04
264	M	Admin Vendor Specific Command Configuration (AVSCC)	0x01
265	O	Autonomous Power State Transition Attributes (APSTA)	0x01
267:266	M	Warning Composite Temperature Threshold (WCTEMP)	0x0157
269:268	M	Critical Composite Temperature Threshold (CCTEMP)	0x0193
271:270	O	Maximum Time for Firmware Activation (MTFA)	0x0000
275:272	O	Host Memory Buffer Preferred Size (HMPRE)	0
279:276	O	Host Memory Buffer Minimum Size (HMMIN)	0

295:280	O	Total NVM Capacity (TNVMCAP)	0
311:296	O	Unallocated NVM Capacity (UNVMCAP)	0
315:312	O	Replay Protected Memory Block Support (RPMBS)	0
511:316	-	Reserved	0
<b>NVM Command Set Attributes</b>			
512	M	Submission Queue Entry Size (SQES)	0x66
513	M	Completion Queue Entry Size (CQES)	0x44
515:514	-	Reserved	0
519:516	M	Number of Namespaces (NN)	0x01
521:520	M	Optional NVM Command Support (ONCS)	0x001E
523:522	M	Fused Operation Support (FUSES)	0
524	M	Format NVM Attributes (FNA)	0
525	M	Volatile Write Cache (VWC)	0x01
527:526	M	Atomic Write Unit Normal (AWUN)	0x00FF
529:528	M	Atomic Write Unit Power Fail (AWUPF)	0x00
530	M	NVM Vendor Specific Command Configuration (NVSCC)	0x01
531	M	Reserved	0
533:532	O	Atomic Compare & Write Unit (ACWU)	0x00
535:534	M	Reserved	0
539:536	O	SGL Support (SGLS)	0x00
703:540	M	Reserved	0
<b>IO Command Set Attributes</b>			
2047:704	M	Reserved	0
2048:2079	M	Power State 0 Descriptor	PSD0
2111:2080	O	Power State 1 Descriptor	PSD1
2143:2112	O	Power State 2 Descriptor	PSD2
2175:2144	O	Power State 3 Descriptor	PSD3
2207:2176	O	Power State 4 Descriptor	PSD4
...	-	(N/A)	0
3071:3040	O	Power State 31 Descriptor	PSD31
<b>Vendor Specific</b>			
4095:3072	O	Vendor Specific (VS)	Reserved

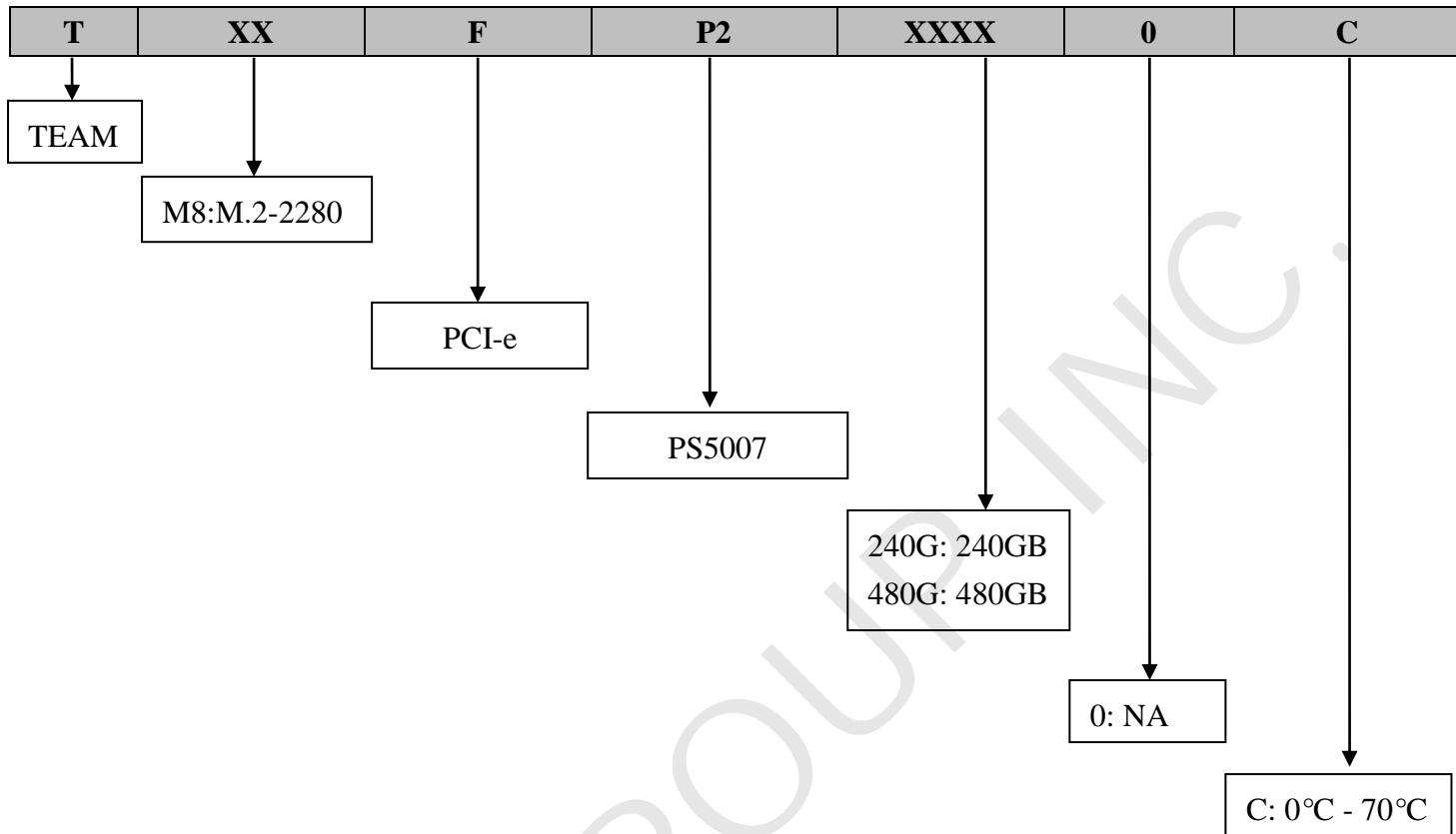
- Identify Namespace Data Structure & NVM Command Set Specific

Bytes	Description
7:0	Namespace Size (NSZE)
15:8	Namespace Capacity (NCAP)
23:16	Namespace Utilization (NUSE)
24	Namespace Features (NSFEAT)
25	Number of LBA Formats (NLBAF)
26	Formatted LBA Size (FLBAS)
27	Metadata Capabilities (MC)
28	End-to-end Data Protection Capabilities (DPC)
29	End-to-end Data Protection Type Settings (DPS)
30	Namespace Multi-path I/O and Namespace Sharing Capabilities (NMIC)
31	Reservation Capabilities (RESCAP)
119:32	Reserved
127:120	IEEE Extended Unique Identifier (EUI64)
131:128	LBA Format 0 Support (LBAF0)
135:132	LBA Format 1 Support (LBAF1)
139:136	LBA Format 2 Support (LBAF2)
143:140	LBA Format 3 Support (LBAF3)
147:144	LBA Format 4 Support (LBAF4)
151:148	LBA Format 5 Support (LBAF5)
155:152	LBA Format 6 Support (LBAF6)
159:156	LBA Format 7 Support (LBAF7)
163:160	LBA Format 8 Support (LBAF8)
167:164	LBA Format 9 Support (LBAF9)
171:168	LBA Format 10 Support (LBAF10)
175:172	LBA Format 11 Support (LBAF11)
179:176	LBA Format 12 Support (LBAF12)
183:180	LBA Format 13 Support (LBAF13)
187:184	LBA Format 14 Support (LBAF14)
191:188	LBA Format 15 Support (LBAF15)
383:192	Reserved
4095:384	Vendor Specific (VS)



## 9. Product Ordering Number

➤ The ordering number rule is as below:



- M.2(NGFF) 2280 SSD

Model Name	Capacity	Description
TM8FP2240G0C101	240GB	TEAM M.2-2280 PCI-E Gen3x4 240GB RETAIL
TM8FP2480G0C101	480GB	TEAM M.2-2280 PCI-E Gen3x4 480GB RETAIL