

RoHS Compliant

PCI Express Disk Module

M.2 PT42 Product Specifications (Toshiba 15nm)

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Version 1.1



Apacer Technology Inc.

1F, No.32, Zhongcheng Rd., Tucheng Dist., New Taipei City, Taiwan, R.O.C

Tel: +886-2-2267-8000 Fax: +886-2-2267-2261

www.apacer.com

Features:

- **Standard PCI Express Bus Interface**
 - PCI Express Specification Rev.2.0*
 - PCI Express Card Electromechanical Rev. 2.0
 - PCI Express Gen2 x 2
 - Supports Separate Reference Clock Independent SSC
- **Capacity**
 - 8, 16, 32, 64, 128 GB
- **Performance****
 - Sequential Read Speed up to 530 MB/s
 - Sequential Write Speed up to 170 MB/s
- **Flash Management**
 - Supports ECC up to 72 bit correction per 1K Byte data
 - Wear leveling
 - Flash bad-block management
 - S.M.A.R.T.
 - Power failure management
- **NAND Flash: MLC**
- **Temperature Range**
 - Operating: 0°C to 70°C
 - Storage: -40°C to 100°C
- **Supply Voltage**
 - 3.3 V ± 5%
- **Power Consumption****
 - Active mode: 780 mA
 - Idle mode: 415 mA
- **Form Factor**
 - M.2 2242-D2-B-M
 - Dimensions: 42.00x22.00x3.70, unit: mm
- **RoHS Compliant**
- **Supports NCQ (Native Command Queue) Commands**
- **Supports AHCI Programming Interface**

*Not backward compatible. Operational instability or inefficiency will occur if this device is applied on a PCIe 1.0 socket.

**Varies from capacities. The performance and power consumption values addressed here are typical and may vary from platforms.

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1. General Description

Apacer's M.2 PT42 module-type SSD offers a breakthrough in non-volatile memory storage. Formed as a compact M.2 2242 form factor, PT42 can fit in various types of embedded platforms, such as workstation, thin computing devices and high-end heavy duty servers where spaces are concerned. Regarding data transfer rate, PT42 delivers ideal data read/write performance.

Apacer M.2 PT42 is designed in PCI-Express 2.0 pinout, and is compatible with 5.0 Gbps maximum transfer rate. Compatibility wise, this M.2 SSD is not only fully compliant with PCI Express Specification Rev.2.0 and Electromechanical Rev.2.0, but also supports NCQ commands and AHCI operational modes.

1.1 Error Correction/Detection

The ECC engine in this device can detect and correct up to 72 bits error in 1K bytes.

1.2 Flash 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". Thus, this device 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.

1.3 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 area get updated more frequently than others, the lifetime of the device would be reduced significantly. Thus, Wear Leveling technique is applied to extend the lifespan of NAND Flash by evenly distributing write and erase cycles across the media. Apacer provides advanced Wear Leveling algorithm, which can efficiently spread out the flash usage through the whole flash media area. Moreover, by implementing both dynamic and static Wear Leveling algorithms, the life expectancy of the NAND Flash is greatly improved.

1.4 Power Failure Management

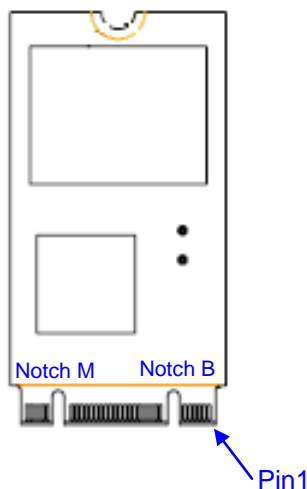
Power Failure Management plays a crucial role when experiencing unstable power supply. Power disruption may occur when users are storing data into the SSD. In this urgent situation, the controller would run multiple write-to-flash cycles to store the metadata for later block rebuilding. This urgent operation requires about several milliseconds to get it done. At the next power up, the firmware will perform a status tracking to retrieve the mapping table and resume previously programmed NAND blocks to check if there is any incompleteness of transmission.

1.5 S.M.A.R.T.

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.

2. Pin Assignments

This connector does not support hot plug capability. There are a total of 75 pins. 12 pin locations are used for mechanical key locations; this allows such a module to plug into both Key B and Key M connectors.



| Pin | Type | Description |
|-----|-------------------|--|
| 1 | CONFIG_3 | Ground (according to M.2 configurations for PCIe SSD definition) |
| 2 | 3.3V | Supply Pin, 3.3V |
| 3 | GND | Ground |
| 4 | 3.3V | Supply pin, 3.3V |
| 5 | No connect | No connect |
| 6 | Not available | No connect (used for other purposes) |
| 7 | Not available | No connect (used for other purposes) |
| 8 | Not available | No connect (used for other purposes) |
| 9 | No connect | No connect |
| 10 | DAS/DSS | Device Activity Signal/Disable Staggered Spin-up |
| 11 | No connect | No connect (used for other purposes) |
| 12 | (removed for key) | Mechanical notch B |
| 13 | (removed for key) | Mechanical notch B |
| 14 | (removed for key) | Mechanical notch B |
| 15 | (removed for key) | Mechanical notch B |
| 16 | (removed for key) | Mechanical notch B |
| 17 | (removed for key) | Mechanical notch B |
| 18 | (removed for key) | Mechanical notch B |
| 19 | (removed for key) | Mechanical notch B |
| 20 | Not available | No connect (used for other purposes) |
| 21 | CONFIG_0 | Ground (according to M.2 configurations for PCIe SSD definition) |

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| Pin | Type | Description |
|-----|---------------|--------------------------------------|
| 22 | Not available | No connect (used for other purposes) |
| 23 | Not available | No connect (used for other purposes) |
| 24 | Not available | No connect (used for other purposes) |
| 25 | Not available | No connect (used for other purposes) |
| 26 | Not available | No connect (used for other purposes) |
| 27 | GND | Ground |
| 28 | Not available | No connect (used for other purposes) |
| 29 | PETn1 | |
| 30 | Not available | No connect (used for other purposes) |
| 31 | PETp1 | |
| 32 | Not available | No connect (used for other purposes) |
| 33 | GND | Ground |
| 34 | Not available | No connect (used for other purposes) |
| 35 | PERn1 | |
| 36 | Not available | No connect (used for other purposes) |
| 37 | PERp1 | |
| 38 | Not available | No connect (used for other purpose) |
| 39 | GND | Ground |
| 40 | Not available | No connect (used for other purposes) |
| 41 | PETn0 | |
| 42 | Not available | No connect (used for other purposes) |
| 43 | PETp0 | |
| 44 | Not available | No connect (used for other purposes) |
| 45 | GND | Ground |
| 46 | Not available | No connect (used for other purposes) |
| 47 | PERn0 | |
| 48 | Not available | No connect (used for other purposes) |
| 49 | PERp0 | |
| 50 | PERST# | |
| 51 | GND | Ground |
| 52 | Not Available | No connect (used for other purposes) |
| 53 | REFCLKN | |
| 54 | Not Available | No connect (used for other purposes) |
| 55 | REFCLKP | |
| 56 | Not Available | No connect (used for other purposes) |
| 57 | GND | Ground |

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| Pin | Type | Description |
|-----|-------------------|--|
| 58 | Not Available | No connect (used for other purposes) |
| 59 | (removed for key) | Mechanical notch B |
| 60 | (removed for key) | Mechanical notch B |
| 61 | (removed for key) | Mechanical notch B |
| 62 | (removed for key) | Mechanical notch B |
| 63 | (removed for key) | Mechanical notch B |
| 64 | (removed for key) | Mechanical notch B |
| 65 | (removed for key) | Mechanical notch B |
| 66 | (removed for key) | Mechanical notch B |
| 67 | Not available | No connect (used for other purposes) |
| 68 | Not available | No connect (used for other purposes) |
| 69 | CONFIG_1 | No connect (according to M.2 configurations for PCIe SSD definition) |
| 70 | 3.3V | Supply pin, 3.3V |
| 71 | GND | Ground |
| 72 | 3.3V | Supply pin, 3.3V |
| 73 | GND | Ground |
| 74 | 3.3V | Supply pin, 3.3V |
| 75 | CONFIG_2 | Ground |

3. Product Specifications

3.1 Capacity

Capacity specifications of M.2 PT42 are available in the table below. It lists the specific capacity and the default numbers of heads, sectors and cylinders for each product line.

Table 3-1 Capacity Specifications

| Capacity | Total bytes* | Cylinders | Heads | Sectors | Max LBA |
|----------|-----------------|-----------|-------|---------|-------------|
| 8 GB | 8,012,390,400 | 15,525 | 16 | 63 | 15,649,200 |
| 16 GB | 16,013,942,784 | 16,383 | 16 | 63 | 31,277,232 |
| 32 GB | 32,017,047,552 | 16,383 | 16 | 63 | 62,533,296 |
| 64 GB | 64,023,257,088 | 16,383 | 16 | 63 | 125,045,424 |
| 128 GB | 128,035,676,160 | 16,383 | 16 | 63 | 250,069,680 |

*Display of total bytes varies from file systems.

**Cylinders, heads or sectors are not applicable for these capacities. Only LBA addressing applies.

LBA count addressed in the table above indicates total user storage capacity and will remain the same throughout the lifespan of the device. However, the total usable capacity of M.2 PT42 is most likely to be less than the total physical capacity because a small portion of the capacity is reserved for device maintenance usages.

3.2 Performance

Performance and random read/write specifications of M.2 PT42 are listed in following tables.

Table 3-2 Performance

| Capacity | 8 GB | 16 GB | 32 GB | 64 GB | 128 GB |
|-------------------------------|------|-------|-------|-------|--------|
| Performance | | | | | |
| Sustained read (MB/s) | 150 | 275 | 445 | 530 | 515 |
| Sustained write (MB/s) | 105 | 150 | 160 | 165 | 170 |

Note: Results may differ from various flash configurations or host system settings.

3.3 Environmental Specifications

Environmental specifications of M.2 PT42 product family follow the MIL-STD-810F standard.

Table 3-3 Environmental Specifications

| Environment | Specifications |
|---------------------------|---|
| Temperature | Operating 0 to 70°C |
| | Storage -40°C to 100°C |
| Vibration (Non-Operating) | Sine wave : 10~2000Hz, 15G (X, Y, Z axes) |
| Shock (Non-Operating) | Half sine wave, 1500 G (X, Y, Z ; All 6 axes) |

4. Electrical Specifications

Caution: Absolute Maximum Stress Ratings – Applied conditions greater than those listed under “Absolute Maximum Stress Ratings” may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these conditions or conditions greater than those defined in the operational sections of this data sheet is not implied. Exposure to absolute maximum stress rating conditions may affect device reliability.

Table 4-1 Absolute Maximum Stress Ratings

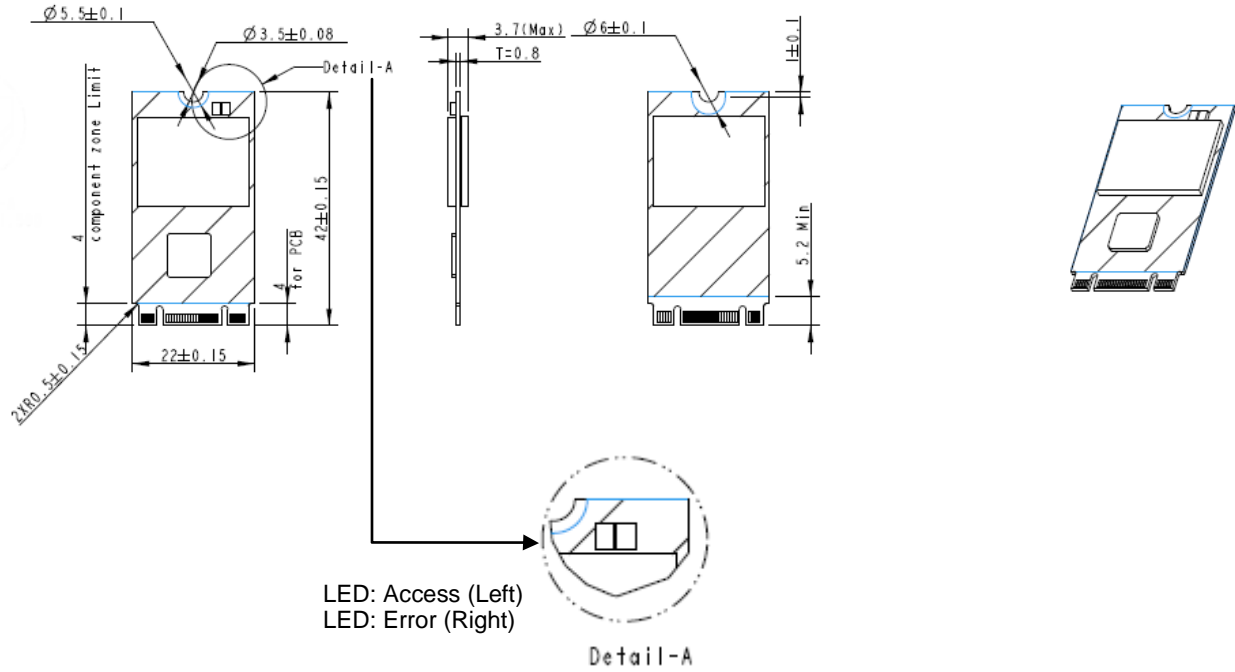
| Parameter | Min. | Typical | Max. | Units |
|----------------------------|------|---------|------|-------|
| Power supply | 3.13 | 3.3 | 3.46 | V |
| Operating case temperature | 0 | | 80 | °C |
| Storage temperature | -40 | | 85 | °C |

Table 4-2 Power Consumption

| State | Capacity | 8 GB | 16 GB | 32 GB | 64 GB | 128 GB |
|-----------|-------------|------|-------|-------|-------|--------|
| | Active (mA) | | 620 | 650 | 665 | 755 |
| Idle (mA) | | 415 | 385 | 385 | 405 | 395 |

*Results may differ from various flash configurations and platforms.

5. Mechanical Specifications

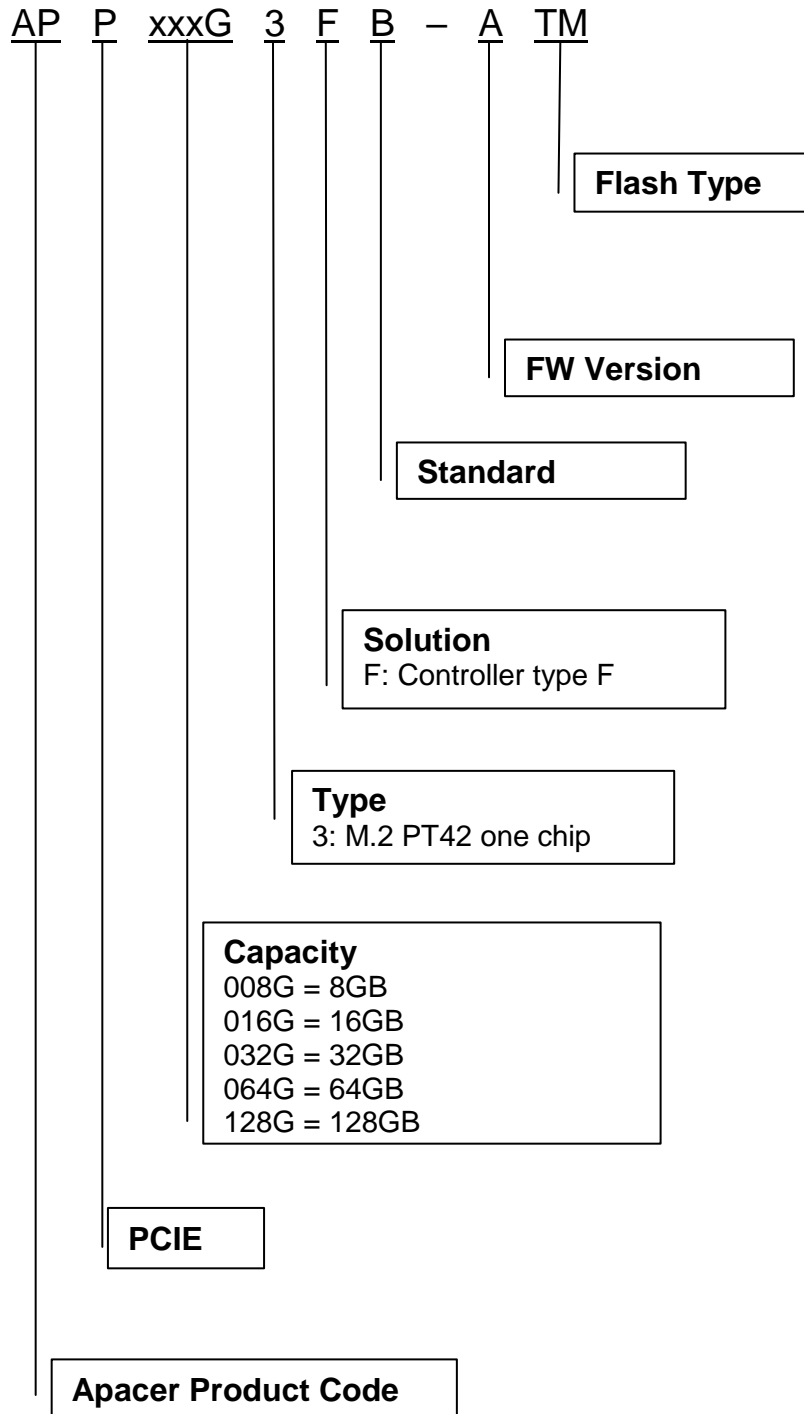


Unit: mm

Tolerance: ± 0.25

6. Product Ordering Information

6.1 Product Code Designations



PCI-Express Disk Module
APPxxxG3FB-ATM



6.2 Valid Combinations

| Capacity | M/N |
|----------|----------------|
| 8GB | APP008G3FB-ATM |
| 16GB | APP016G3FB-ATM |
| 32GB | APP032G3FB-ATM |
| 64GB | APP064G3FB-ATM |
| 128GB | APP128G3FB-ATM |

Note: Valid combinations are those products in mass production or will be in mass production. Consult your Apacer sales representative to confirm availability of valid combinations and to determine availability of new combinations.

Revision History

| Revision | Date | Description | Remark |
|----------|-----------|-------------------|--------|
| 1.0 | 3/8/2016 | Official release | |
| 1.1 | 4/19/2016 | Added 8GB support | |

Global Presence

| | |
|------------------------------|---|
| Taiwan (Headquarters) | Apacer Technology Inc. 1F., No.32, Zhongcheng Rd., Tucheng Dist., New Taipei City 236, Taiwan R.O.C. Tel: 886-2-2267-8000 Fax: 886-2-2267-2261 amtsales@apacer.com |
| U.S.A. | Apacer Memory America, Inc. 46732 Lakeview Blvd., Fremont, CA 94538 Tel: 1-408-518-8699 Fax: 1-510-249-9568 sa@apacerus.com |
| Japan | Apacer Technology Corp. 5F, Matsura Bldg., Shiba, Minato-Ku Tokyo, 105-0014, Japan Tel: 81-3-5419-2668 Fax: 81-3-5419-0018 jpservices@apacer.com |
| Europe | Apacer Technology B.V. Science Park Eindhoven 5051 5692 EB Son, The Netherlands Tel: 31-40-267-0000 Fax: 31-40-267-0000#6199 sales@apacer.nl |
| China | Apacer Electronic (Shanghai) Co., Ltd Room D, 22/FL, No.2, Lane 600, JieyunPlaza, Tianshan RD, Shanghai, 200051, China Tel: 86-21-6228-9939 Fax: 86-21-6228-9936 sales@apacer.com.cn |
| India | Apacer Technologies Pvt Ltd, Unit No.201, "Brigade Corner", 7 th Block Jayanagar, Yediyur Circle, Bangalore – 560082, India Tel: 91-80-4152-9061 Fax: 91-80-4170-0215 sales_india@apacer.com |