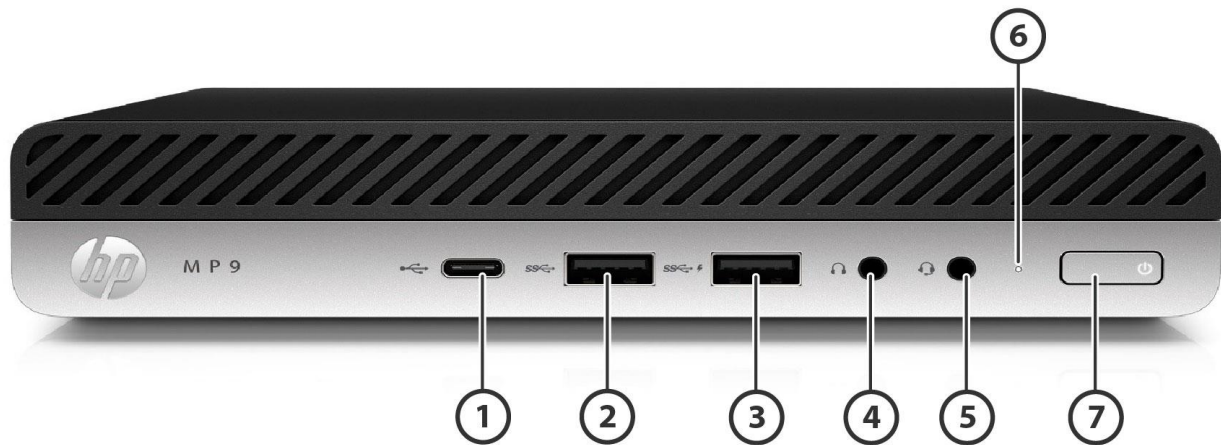


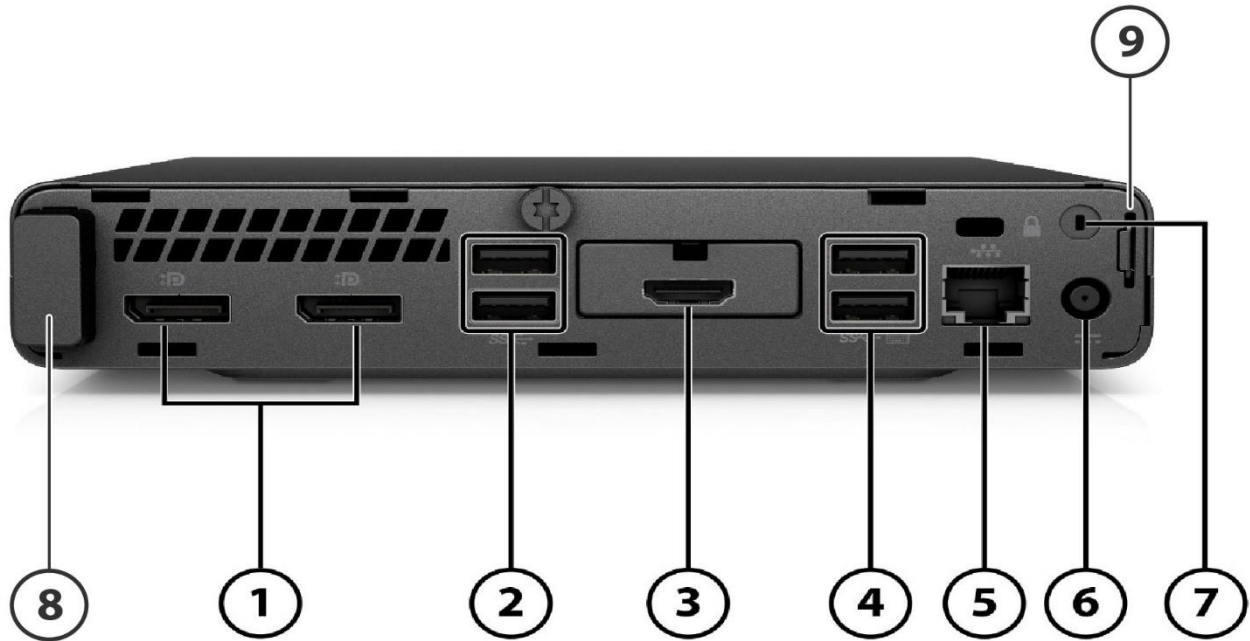
## HP MP9 G4 Retail System



### FRONT VIEW

1. USB 3.1 Gen 2 Type-C™ port (10 Gbits/s data speed)
2. USB 3.1 Gen 2 port (10 Gbits/s data speed)
3. USB 3.1 Gen 1 charging port (5 Gbits/s data speed)
4. Headphone Jack
5. Universal Audio Jack with CTIA headset support
6. Hard drive activity light
7. Dual-state power button

### Overview



#### REAR VIEW

- |                                                                                                                           |                                    |
|---------------------------------------------------------------------------------------------------------------------------|------------------------------------|
| 1. (2) Dual-Mode DisplayPort™ 1.2 (DP++)                                                                                  | 5. RJ45 network connector          |
| 2. (2) USB 3.1 Gen 2 port (10 Gbits/s data speed)                                                                         | 6. Power connector                 |
| 3. Configurable I/O Port (Choice of DisplayPort™ 1.2, HDMI™ 2.0, VGA, USB Type-C™ with Display Output or Serial)          | 7. External WLAN antenna opening * |
| 4. (2) USB 3.1 Gen 1 port (5 Gbits/s data speed) (Supporting wak S4/S5 with keyboard/mouse connected and enabled in BIOS) | 8. Internal WLAN antenna cover     |
|                                                                                                                           | 9. Padlock loop                    |

\*Must be configured at time of purchase

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## Overview

### AT A GLANCE

- HP developed and engineered UEFI BIOS supporting security, manageability and software image stability
- Latest Intel® 300 Series chipsets supporting latest Intel® 8 Generation Core™ processors<sup>1</sup>, featuring integrated Intel® UHD Graphics and optional Intel® vPro™ Technology (vPro™ is optional and requires factory configuration, available with Core i5 and Core i7 processors only)<sup>3</sup>
- Processor support up to 35W
- Intel® Optane memory available as optional feature
- Choice of Windows 10 Professional, and FreeDOS 2.0
- Integrated 10/100/1000 Ethernet Controller, with optional 802.11ac Wi-Fi and/or Bluetooth® 5.0
- Up to 32 GB of DDR4 Synchronous Dynamic Random Access Memory (SDRAM)
- Support for up to three video outputs via two standard video connectors and an optional third video port connector which provides the following choices: DisplayPort™ 1.2, HDMI™ 2.0, VGA, or USB Type-C™ with Display Output
- Multiple data drives setup in a RAID array is optional and requires product to be configured with vPro™ at purchase
- Optional Serial port available
- Trusted Platform Module (TPM) 2.0<sup>2</sup>
- HP SureStart Gen4
- HP BIOSphere Gen4
- HP Client Security Manager Gen4
- HP Sure Click
- HP Manageability Integration Kit Gen2
- HP Image Assistant Gen3
- HP Support Assistant
- High efficiency energy saving power supply
- ENERGY STAR® certified. EPEAT® Gold registered where applicable/supported. Registration may vary by country. See <http://www.epeat.net> for registration status by country. Search keyword generator on HP's 3rd party option store for solar generator accessories at <http://www.hp.com/go/options>.
- PC chassis and all internal components and modules are manufactured with low halogen content<sup>3</sup>
- Low halogen<sup>3</sup>
- Dust filter available
- Protected by HP Services, including limited warranties up to 3-3-3 (terms and conditions vary by country; certain restrictions and exclusions apply); Care Packs available with up to 5 years Next Business Day Onsite Hardware Support

1. Multi core is designed to improve performance of certain software products. Not all customers or software applications will necessarily benefit from use of this technology. Performance and clock frequency will vary depending on application workload and your hardware and software configurations. Intel's numbering, branding and/or naming is not a measurement of higher performance

2. In some scenarios, machines pre-configured with Windows OS might ship with TPM turned off

3 External power supplies, power cords, cables and peripherals are not low halogen. Service parts obtained after purchase may not be low halogen.

4. Some functionality of vPro technology, such as Intel Active management technology and Intel Virtualization technology, requires additional 3rd party software in order to run. Availability of future "virtual appliances" applications for Intel vPro technology is dependant on 3rd party software providers. Compatibility of this generation of Intel vPro technology-based hardware with with future "virtual appliances" is yet to be determined.

**NOTE: See important legal disclosures for all listed specs in their respective features sections.**

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## Standard Features and Configurable Components

### OPERATING SYSTEM

#### Preinstalled

Windows® 10 IoT Enterprise 2016 LTSB 64-bit

Windows® 10 Pro 64<sup>1</sup>

FreeDos 2.0

1. Not all features are available in all editions or versions of Windows. Systems may require upgraded and/or separately purchased hardware, drivers, software or BIOS update to take full advantage of Windows functionality. Windows 10 is automatically updated, which is always enabled. ISP fees may apply and additional requirements may apply over time for updates. See <http://www.windows.com/>.

**NOTE:** Your product does not support Windows 8 or Windows 7. In accordance with Microsoft's support policy, HP does not support the Windows® 8 or Windows 7 operating system on products configured with Intel and AMD 7th generation and forward processors or provide any Windows® 8 or Windows 7 drivers on <http://www.support.hp.com>

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### PROCESSORS

#### Intel® 8th Generation Core™ Processors

Intel® Core™ i7-8700T with Intel® UHD Graphics 630 (2.4 GHz, up to 4.0 GHz with Intel Turbo Boost, 12 MB cache, 6 cores)<sup>1,3,4</sup>

Intel® Core™ i7+8700T (Core i7 and Intel® Optane™ Memory) with Intel® UHD Graphics 630 (2.4 GHz, up to 4.0 GHz with Intel Turbo Boost, 12 MB cache, 6 cores)<sup>1,2,3,4</sup>

Intel® Core™ i5-8500T with Intel® UHD Graphics 630 (2.1 GHz, up to 3.5 GHz with Intel Turbo Boost, 9 MB cache, 6 cores)<sup>1,3,4</sup>

Intel® Core™ i5+8500T (Core i5 and Intel® Optane™ Memory) with Intel® UHD Graphics 630 (2.1 GHz, up to 3.5 GHz with Intel Turbo Boost, 9 MB cache, 6 cores)<sup>1,2,3,4</sup>

Intel® Core™ i3-8100T with Intel® UHD Graphics 630 (3.1 GHz, 6 MB cache, 4 cores)

#### Intel® 8th Generation Pentium® Processors

Intel® Pentium® G5400T with Intel® UHD Graphics 610 (3.1 GHz, 4MB cache, 2 cores)

#### Intel® 8th Generation Celeron® Processors

Intel® Celeron® G4900T with Intel® UHD Graphics 610 (2.9 GHz, 2 MB cache, 2 cores)

1: Multi-core is designed to improve performance of certain software products. Not all customers or software applications will necessarily benefit from use of this technology. Performance and clock frequency will vary depending on application workload and your hardware and software configurations. Intel's numbering, branding and/or naming is not a measurement of higher performance.

2. Intel® Optane™ memory system acceleration does not replace or increase the DRAM in your system and requires configuration with an optional Intel® Core™ i(5 or 7)+ processor.

3. Intel® Turbo Boost technology requires a PC with a processor with Intel Turbo Boost capability. Intel Turbo Boost performance varies depending on hardware, software and overall system configuration. See [www.intel.com/technology/turboboost](http://www.intel.com/technology/turboboost) for more information.

4. Some functionality of vPro technology, such as Intel Active management technology and Intel Virtualization technology, requires additional 3rd party software in order to run. Availability of future "virtual appliances" applications for Intel vPro technology is dependent on 3rd party software providers. Compatibility with future "virtual appliances" is yet to be determined

**NOTE:** S-Processor 6+2 DDR4 2666 MT/s 2 DPC UDIMM is supported when channel is populated with the same UDIMM part number

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*Standard Features and Configurable Components*

## **CHIPSET**

Intel® Q370 Chipset

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### *Standard Features and Configurable Components*

## **GRAPHICS**

### **Integrated**

Intel® UHD Graphics 630 (integrated on 8th gen Core i7/i5/i3 processors)

Intel® UHD Graphics 610 (integrated on Pentium® G5400T, Celeron® G4900T)

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## **ADAPTERS AND CABLES**

HP DisplayPort™ Cable

HP DVI Cable

HP DisplayPort™ to DVI-D Adapter

HP DisplayPort™ to HDMI True 4K Adapter

HP DisplayPort™ to VGA Adapter

HP USB-C™ to USB 3.0

HP USB-C™ to DisplayPort™ Adapter

HP USB to Serial Port Adapter

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### Standard Features and Configurable Components

## STORAGE

### 2.5 inch SATA Hard Disk Drives (HDD)

500GB 7200RPM 2.5in SATA HDD

1TB 7200RPM 2.5in SATA HDD

2TB 5400RPM 2.5in SATA HDD

500GB 7200RPM 2.5in Self Encrypted OPAL2 SATA HDD

500GB 7200RPM 2.5in Self Encrypted Federal Information Processing Standard SATA HDD

### 2.5 inch Solid State Hybrid Drives (SSHD)

500GB 5400RPM 2.5in SATA SSHD

1TB 5400RPM 2.5in SATA SSHD

2TB 5400RPM 2.5in SATA SSHD

### 2.5 inch Solid State Drives (SSD)

256GB 2.5in SATA Three Layer Cell SSD

512GB 2.5in SATA Three Layer Cell SSD

256GB 2.5in SATA Self Encrypted OPAL2 Three Layer Cell SSD

512GB 2.5in SATA Self Encrypted OPAL2 Three Layer Cell SSD

256GB 2.5in SATA Self Encrypted Federal Information Processing Standard SSD

512GB 2.5in SATA Self Encrypted Federal Information Processing Standard SSD

### M.2 PCIe NVMe Solid State Drives (SSD)

128GB M.2 2280 PCIe NVMe SSD

256GB M.2 2280 PCIe NVMe SSD

512GB M.2 2280 PCIe NVMe SSD

128GB M.2 2280 PCIe NVMe Three Layer Cell SSD

256GB M.2 2280 PCIe NVMe Three Layer Cell SSD

512GB M.2 2280 PCIe NVMe Three Layer Cell SSD

1TB M.2 2280 PCIe NVMe Three Layer Cell

256GB M.2 2280 PCIe NVMe Self Encrypted OPAL2 Three Layer Cell SSD

512GB M.2 2280 PCIe NVMe Self Encrypted OPAL2 Three Layer Cell SSD

1TB PCIe-3x4 NVMe Three Layer Cell

Intel® Optane 118GB 2280 PCIe NVMe

**NOTE:** For storage drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 36 GB (for Windows 10) of system disk is reserved for system recovery software.

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## MEMORY

### Type

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### Standard Features and Configurable Components

DDR4-2666 (Transfer rates up to 2666 MT/s), 32 GB, 2 SODIMM

#### Memory Configuration

4 GB (4 GB x 1)  
8 GB (4 GB x 2)  
8 GB (8 GB x 1)  
16 GB (8 GB x 2)  
16 GB (16 GB x 1)  
32 GB (16 GB x 2)

**NOTE:** For systems configured with more than 3 GB of memory and a 32-bit operating system, all memory may not be available due to system resource requirements. Addressing memory above 4 GB requires a 64-bit operating system.

Memory modules support data transfer rates up to 2133 MT/s; actual data rate is determined by the system's configured processor. See processor specifications for supported memory data rate.

All memory slots are customer accessible / upgradeable.

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## NETWORKING/COMMUNICATIONS

#### Ethernet (RJ45)

Intel® I219-LM Gigabit Network Connection (standard)

#### Wireless<sup>1</sup>

Intel® 9560 802.11ac 2x2 with Bluetooth® M.2 Combo Card vPro™

Intel® 9560 802.11ac 2x2 with Bluetooth® M.2 Combo Card non-vPro™

Realtek RTL8822BE 802.11ac 2x2 with Bluetooth® M.2 Combo Card

Realtek RTL8821CE 802.11ac 1x1 with Bluetooth® M.2 Combo Card

<sup>1</sup>Wireless access point and internet service required. The specifications for the 802.11ac WLAN are draft specifications and are not final. If the final specifications differ from the draft specifications, it may affect the ability of the notebook to communicate with other 802.11ac WLAN devices

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### Standard Features and Configurable Components

#### KEYBOARDS AND POINTING DEVICES\*

##### Keyboard

- HP USB Business Slim Standalone Wired Keyboard
- HP USB Business Slim Wired SmartCard CCID Keyboard
- HP USB & PS/2 Washable Standalone Wired Keyboard
- HP Collaboration Wireless Keyboard
- HP USB Collaboration Wired Keyboard
- HP USB Conferencing Wired Keyboard
- HP USB Wired Keyboard

##### Keyboard & Mouse Combo

- HP Premium Wireless Keyboard and Mouse
- HP Business Slim Wireless Keyboard and Mouse
- HP USB Keyboard and Mouse Healthcare Edition
- HP USB Keyboard and Mouse Wired Value

##### Mice

- HP USB Universal Wired Mouse
- HP USB Optical Mouse
- HP USB Hardened Mouse
- HP USB 1000dpi Laser Mouse
- HP USB & PS/2 Washable Wired Mouse Standalone
- HP USB Premium Wired Mouse

[\\*Availability may vary by country](#)

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#### POWER

External, 65 W 89% efficient

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#### WEIGHTS & DIMENSIONS

##### Dimensions (W x D x H)

177 x 175 x 34.2 mm

6.97 x 6.89 x 1.35 in

##### Weight\*

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### Standard Features and Configurable Components

1.25 kg/2.74 lbs

#### **Max. Weight Supported (desktop orientation)**

N/A

#### **System Volume**

64 cu in (cubic inches)

1.05 L

#### **Packaging Dimensions (H x W x D)**

19.57 x 5.04 x 8.78 in

497 x 128 x 223 mm

#### **Shipping Weight**

2.97 kg/ 6.52 lbs

#### **Palletization Profile**

18-units per layer

5 or 6 layers max depending on details of air freight

90 or 108 units per pallet depending on details of air freight

45.354 x 39.13 x 75.551 in, 1152 x 994 x 1919 mm (include pallet)

*\*configured with 1 HDD only*

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## PORTS

3 - USB 3.1 Gen 1 (1 front, 2 rear)

3 - USB 3.1 Gen 2 (1 front, 2 rear)

1 - USB Type-C™ 3.1 Gen 2 (front)

1 - USB Type-C™ 3.1 Gen 2 (optional) (rear)

2 - DisplayPort™ 1.2

1 - Configurable video port (Choice of DisplayPort™ 1.2 , HDMI™ 2.0, VGA, or USB Type-C™ with display output)

1 - RJ-45

1 - Headphone

1 - Universal Audio Jack with CTIA headset support

1 - Serial (RS-232) optional - replaces 1 DisplayPort™ 1.2

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## SLOTS

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### *Standard Features and Configurable Components*

- 1 - M.2 PCIe x4-2230 (for WLAN)
  - 2 - M.2 PCIe x4-2280/2230 combo (for storage)
- 

### **BAYS**

- 1 - 2.5" Internal storage drive

**NOTE 1:** Non-internal bay

**NOTE 2:** Must be configured at time of purchase

For Desktop Mini with M.2 Storage config, there will be no SATA drive bracket. If you plan to use or upgrade the storage with any 2.5" SATA drive, please select a DM SATA Drive Bracket (available as both factory configured and after market option).

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### Standard Features and Configurable Components

## HP BIOS

### HP BIOSphere

Key features of the HP BIOS include:

- Deployment and manageability – HP BIOS provides several technologies that help integrate the HP MP9 G4 Retail System into the environment, such as PXE, remote configuration, remote control, and BIOS (F10) Setup support for 14 languages.
- Network firmware updates – Update your BIOS via the cloud or standardize on a BIOS version hosted on an Enterprise network.
- Stability – HP BIOS supports the HP stable product roadmap by releasing only critical BIOS changes to the factory and advanced change notification.
- UEFI specification version 2.5
- Absolute Persistence agent – For tracking and tracing services, available in select countries, separate software and purchase of a subscription is required.
- Thermal and power management – The HP BIOS provides and enables thermal and power management technologies so component temperatures are managed for high reliability and to assist in operating the HP Business Desktop computer in any enterprise environment.
- Acoustic performance – Industry leading acoustic emissions across the range of operating conditions.
- Serviceability – HP BIOS provides diagnostic and detailed service information.
- Upgrades and recovery – HP BIOS provides numerous ways to upgrade HP Business Desktop computers, including BIOS updates from within Windows (HPBIOSUPDREC), HP Client Manager, and fail-safe recovery. In addition, the HP BIOS Configuration Utility enables replication of BIOS settings within Windows while the Replicated Setup feature provides the same capability within BIOS (F10) Setup. The BIOS Configuration Utility is available from the HP support website.
- HP BIOS uses PKI signing of the BIOS for trusted BIOS upgrades and recovery.
- Additional HP BIOS Features:
- Power-On password – Helps prevent an unauthorized user from powering on the system.
- Administrator password – Also known as the setup password, this helps prevent unauthorized changes to the system configuration. If the administrator password is not known, the BIOS cannot be updated and changes cannot be made to BIOS settings using BIOS Setup or under the OS.
- S5 Maximum Power Savings setting supports EU Lot6 requirement and allows the computer to power down below 0.5W in S5 (when turned off). When S5 Maximum Power Savings feature is enabled below features are turned off: - Power to expansion connectors / slots - Wake events other than power buttons (such as wake on LAN) - USB charging ports
- HP SureStart
- BIOS Integrity checking – Sure Start protection ensures that only trusted BIOS code is executed and not rootkits, viruses and malware. Verification is done upon boot up, shutdown and while On.
- Sure Start is set by default to automatically repair the BIOS if corrupted or compromised but is policy driven for better manageability.
- Protecting beyond BIOS – Integrity checking and repair is extended to other data that should be protected such as network configuration parameters (network name), platform specific information (i.e. system IDs) and other code the system needs to boot.
- Audit enabled – System Audit via Sure Start Event Logs capture data such as incident, repair date and time for troubleshooting and investigating.

**NOTE:** DisplayPort™ multi-stream monitors 'daisy-chained' together.

## SECURITY

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### Standard Features and Configurable Components

Trusted Platform Module (TPM) 2.0 (Infineon SLB9670). Common Criteria EAL4+ Certified. Downgradeable to TPM 1.2.

Convertible to FIPS 140-2 Certified mode.

Intrusion Sensor for DM (integrated in the PCA, can be enabled/disabled through BIOS)

Support for chassis cable lock devices

Support for chassis padlocks devices

Support for table lock

SATA port disablement (via BIOS)

Serial, USB enable/disable (via BIOS)

Intel® Identify Protection Technology (IPT)<sup>1</sup>

Removable media write/boot control

Power-on password (via BIOS)

Setup password (via BIOS)

1. Models configured with Intel® Core™ processors have the ability to utilize advanced security protection for online transactions. IPT, used in conjunction with participating web sites, provides double identity authentication by adding a hardware component in addition to the usual user name and password. IPT is initialized through an HP Client Security module

**NOTE:** Multi-Core is designed to improve performance of certain software products. Not all customers or software applications will necessarily benefit from use of this technology. 64-bit computing system required. Performance and clock frequency will vary depending on application workload and your hardware and software configurations. Intel's numbering is not a measurement of higher performance.

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### Technical specifications - Environmental

#### ENVIRONMENTAL DATA

<b>Eco-Label Certifications &amp; declarations</b>	<p>This product has received or is in the process of being certified to the following approvals and may be labeled with one or more of these marks:</p> <ul style="list-style-type: none"> <li>• IT ECO declaration</li> <li>• US ENERGY STAR®</li> <li>• EPEAT® Gold registered in the United States. See <a href="http://www.epeat.net">http://www.epeat.net</a> for registration status in your country.</li> </ul>		
<b>System Configuration</b>	The configuration used for the Energy Consumption and Declared Noise Emissions data for the Desktop model is based on a “Typically Configured Desktop”.		
<b>Energy Consumption (in accordance with US ENERGY STAR® test method)</b>	115VAC, 60Hz	230VAC, 50Hz	100VAC, 60Hz
<b>Normal Operation (Short idle)</b>	4.811	4.901	4.677
<b>Normal Operation (Long idle)</b>	4.373	4.391	4.298
<b>Sleep</b>	0.561	0.608	0.559
<b>Off</b>	0.529	0.559	0.52
	<p><b>NOTE:</b> Energy efficiency data listed is for an ENERGY STAR® compliant product if offered within the model family. HP computers marked with the ENERGY STAR® Logo are compliant with the applicable U.S. Environmental Protection Agency (EPA) ENERGY STAR® specifications for computers. If a model family does not offer ENERGY STAR® compliant configurations, then energy efficiency data listed is for a typically configured PC featuring a hard disk drive, a high efficiency power supply, and a Microsoft Windows® operating system.</p>		
<b>Heat Dissipation*</b>	115VAC, 60Hz	230VAC, 50Hz	100VAC, 60Hz
<b>Normal Operation (Short idle)</b>	16.4055	16.7124	15.9486
<b>Normal Operation (Long idle)</b>	14.9119	14.9733	14.6562
<b>Sleep</b>	1.913	2.0733	1.9062
<b>Off</b>	1.8039	1.9062	1.7732
	<p><b>NOTE:</b> Heat dissipation is calculated based on the measured watts, assuming the service level is attained for one hour.</p>		
<b>Declared Noise Emissions (in accordance with ISO 7779 and ISO 9296)</b>	Sound Power (LWAd, bels)	Sound Pressure (LpAm, decibels)	
<b>Typically Configured – Idle</b>	3.1	20	

### Technical specifications - Environmental

<b>Fixed Disk – Random writes</b>	4.4	33
<b>Longevity and Upgrading</b>	This product can be upgraded, possibly extending its useful life by several years. Upgradeable features and/or components contained in the product may include: Spare parts are available throughout the warranty period and or for up to “5” years after the end of production.	
<b>Batteries</b>	This battery(s) in this product comply with EU Directive 2006/66/EC Batteries used in the product do not contain: Mercury greater the 1ppm by weight Cadmium greater than 20ppm by weight Battery size: CR2032 (coin cell) Battery type: Lithium	
<b>Additional Information</b>	<ul style="list-style-type: none"> <li>• This product is in compliance with the Restrictions of Hazardous Substances (RoHS) directive - 2011/65/EC.</li> <li>• This HP product is designed to comply with the Waste Electrical and Electronic Equipment (WEEE) Directive – 2002/96/EC.</li> <li>• This product is in compliance with California Proposition 65 (State of California; Safe Drinking Water and Toxic Enforcement Act of 1986).</li> <li>• This product is in compliance with the IEEE 1680 (EPEAT) standard at the &lt;gold&gt; level, see <a href="http://www.epeat.net">www.epeat.net</a></li> <li>• Plastics parts weighing over 25 grams used in the product are marked per ISO11469 and ISO1043.</li> <li>• This product contains 0% post-consumer recycled plastic (by wt.)</li> <li>• This product is 95.1% recycle-able when properly disposed of at end of life.</li> </ul>	
<b>Packaging Materials</b>	External:	PAPER/Corrugated
	Internal:	PLASTIC/EPE (Expanded Polyethylene)
		PLASTIC/Polyethylene low density
<b>Material Usage</b>	<p>This product does not contain any of the following substances in excess of regulatory limits (refer to the HP General Specification for the Environment at <a href="http://www.hp.com/hpinfo/globalcitizenship/environment/pdf/gse.pdf">http://www.hp.com/hpinfo/globalcitizenship/environment/pdf/gse.pdf</a>):</p> <ul style="list-style-type: none"> <li>• Asbestos</li> <li>• Certain Azo Colorants</li> <li>• Certain Brominated Flame Retardants – may not be used as flame retardants in plastics</li> <li>• Cadmium</li> <li>• Chlorinated Hydrocarbons</li> <li>• Chlorinated Paraffins</li> <li>• Formaldehyde</li> <li>• Halogenated Diphenyl Methanes</li> <li>• Lead carbonates and sulfates</li> <li>• Lead and Lead compounds</li> <li>• Mercuric Oxide Batteries</li> <li>• Nickel – finishes must not be used on the external surface designed to be frequently handled or carried by the user.</li> </ul>	

### Technical specifications - Environmental

	<ul style="list-style-type: none"> <li>• Ozone Depleting Substances</li> <li>• Polybrominated Biphenyls (PBBs)</li> <li>• Polybrominated Biphenyl Ethers (PBBEs)</li> <li>• Polybrominated Biphenyl Oxides (PBBOs)</li> <li>• Polychlorinated Biphenyl (PCB)</li> <li>• Polychlorinated Terphenyls (PCT)</li> <li>• Polyvinyl Chloride (PVC) – except for wires and cables, and certain retail packaging has been voluntarily removed from most applications.</li> <li>• Radioactive Substances</li> <li>• Tributyl Tin (TBT), Triphenyl Tin (TPT), Tributyl Tin Oxide (TBTO)</li> </ul>
<b>Packaging Usage</b>	<p>HP follows these guidelines to decrease the environmental impact of product packaging:</p> <ul style="list-style-type: none"> <li>• Eliminate the use of heavy metals such as lead, chromium, mercury and cadmium in packaging materials.</li> <li>• Eliminate the use of ozone-depleting substances (ODS) in packaging materials.</li> <li>• Design packaging materials for ease of disassembly.</li> <li>• Maximize the use of post-consumer recycled content materials in packaging materials.</li> <li>• Use readily recyclable packaging materials such as paper and corrugated materials.</li> <li>• Reduce size and weight of packages to improve transportation fuel efficiency.</li> <li>• Plastic packaging materials are marked according to ISO 11469 and DIN 6120 standards.</li> </ul>
<b>End-of-life Management and Recycling4</b>	<p>HP Inc. offers end-of-life HP product return and recycling programs in many geographic areas. To recycle your product, please go to: <a href="http://www.hp.com/go/reuse-recycle">http://www.hp.com/go/reuse-recycle</a> or contact your nearest HP sales office. Products returned to HP will be recycled, recovered or disposed of in a responsible manner.</p> <p>The EU WEEE directive (2002/95/EC) requires manufacturers to provide treatment information for each product type for use by treatment facilities. This information (product disassembly instructions) is posted on the Hewlett Packard web site at: <a href="http://www.hp.com/go/recyclers">http://www.hp.com/go/recyclers</a>. These instructions may be used by recyclers and other WEEE treatment facilities as well as HP OEM customers who integrate and re-sell HP equipment.</p> <p>Global Citizenship Report  <a href="http://www.hp.com/hpinfo/globalcitizenship/gcreport/index.html">http://www.hp.com/hpinfo/globalcitizenship/gcreport/index.html</a></p> <p>Eco-label certifications  <a href="http://www8.hp.com/us/en/hp-information/environment/ecolabels.html">http://www8.hp.com/us/en/hp-information/environment/ecolabels.html</a></p> <p>ISO 14001 certificates:  <a href="http://www.hp.com/hpinfo/globalcitizenship/environment/pdf/PC_GBU_Product_Design_ISO_14K_Certificate.pdf">http://www.hp.com/hpinfo/globalcitizenship/environment/pdf/PC_GBU_Product_Design_ISO_14K_Certificate.pdf</a>          and  <a href="http://www.hp.com/hpinfo/globalcitizenship/environment/pdf/cert.pdf">http://www.hp.com/hpinfo/globalcitizenship/environment/pdf/cert.pdf</a></p>

## Miscellaneous Features

### Management Features

Advanced Configuration and Power Management Interface (ACPI). Allows the system to wake from a low power mode. Controls system power consumption, making it possible to place



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### Technical specifications - Environmental

individual cards and peripherals in a low-power or powered-off state without affecting other elements of the system.

Intel® Wired for Management support; industry wide initiative to make Intel® architecture based PCs, servers and mobile computers more inherently manageable out-of-the-box and over the network

Dual State Power Button; acts as both an on/off button and a suspend-to-sleep button

#### Serviceability Features

Dual colored power LED on front of computer to indicate either normal or fault condition

Diagnostic LED Explanation Table:

Power LED will blink red 2 to 5 times, then blink white 2 or more times, then repeat (with beep tones for each

blink initially):

2 red + 2 white User must provide file for BIOS recovery (USB storage typically)

2 red + 3 white User must enter a key sequence to proceed with recovery by policy

2 red + 4 white BIOS recovery is in progress

3 red + 2 white Memory could not be initialized

3 red + 3 white Graphics adaptor could not be found

3 red + 4 white Power supply failure / not connected

3 red + 5 white Processor not installed

3 red + 6 white Current processor does not support an enabled feature

4 red + 2 white Processor has exceeded its temperature threshold / system thermal shutdown

4 red + 3 white System internal temperature has exceeded its threshold

5 red + 2 white System controller firmware is not valid

5 red + 3 white System controller detected BIOS is not executing

5 red + 4 white BIOS could not complete initialization / PCA failure

5 red + 5 white System controller rebooted the system after a health or recovery timer triggered

HP PC Hardware Diagnostics UEFI:

This utility enables hardware level testing outside the operating system on many components.

The diagnostics can be invoked by pressing F2 at POST, and is available as a download from HP Support

System/Emergency ROM

Flash ROM

CMOS Battery Holder for easy replacement

Flash Recovery with Video Configuration Record Software

5 Aux Power LED on System PCA

Processor ZIF Socket for easy Upgrade

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### *Technical specifications - Environmental*

Over-Temp Warning on Screen (Requires IM Agents)

Clear Password Jumper

DIMM Connectors for easy Upgrade

Clear CMOS Button

NIC LEDs (integrated) (Green & Amber)

Dual Color Power and HD LED - To Indicate Normal Operations and Fault Conditions

Color coordinated cables and connectors

Tool-less Hood Removal

Front power switch

System memory can be upgraded without removing the system board or any internal components

Tool-less Hard Drive, CD & Diskette Removal

Green Pull Tabs, and Quick Release Latches for easy Identification

### **Additional Features**

<b>Towerable Orientation</b>	Product can be oriented as either a desktop (horizontal) or a tower (vertical)
<b>Drive Lock</b>	Implementation of the industry standard ATA Security feature set. When enabled, it prevents software access to user data on the drive until one or two user-defined passwords are provided.
<b>Drive Protection System</b>	<p>DPS Access through F10 Setup during Boot</p> <p>A diagnostic hard drive self-test. It scans critical physical components and every sector of the hard drive for physical faults and then reports any faults to the user</p> <p>Running independently of the operating system, it can be accessed through a Windows-based diagnostics utility or through the computer's setup procedure. It produces an evaluation on whether the hard drive is the source of the problem and needs to be replaced</p> <p>The system expands on the Self-Monitoring, Analysis, and Reporting Technology (SMART), a continuously running systems diagnostic that alerts the user to certain types of failures</p>
<b>SMART Technology (Self-Monitoring, Analysis and Reporting Technology)</b>	Allows hard drives to monitor their own health and to raise flags if imminent failures were predicted

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### *Technical specifications - Environmental*

<b>SMART I - Drive Failure Prediction</b>	Predicts failures before they occur. Tracks fault prediction and failure indication parameters such as re-allocated sector count, spin retry count, calibration retry count
<b>SMART II - Off-Line Data Collection</b>	By avoiding actual hard drive failures, SMART hard drives act as "insurance" against unplanned user downtime and potential data loss from hard drive failure
<b>SMART III - Off-Line Read Scanning with Defect Reallocation</b>	IOEDC: I/O Error Detection Circuitry
<b>SMART IV - End-to-End CRC for hard drives</b>	Detects errors in Read/Write buffers on HDD cache RAM

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### Technical Specifications – Service and Support

#### SERVICE AND SUPPORT

Limited Warranty: Three-year (3-3-3) limited warranty delivers three years of on-site<sup>1</sup>, next business day<sup>2</sup> service for parts and labor and includes free support 24 x 7<sup>3</sup>. Three-year onsite and labor are not available in all countries. Service offers terms up to 5 years by choosing an optional HP Care Pack. To choose the right level of service for your HP product, visit HP Care Pack Central: <http://www.hp.com/go/cpc><sup>4</sup>

**NOTE 1:** Terms and conditions may vary by country. Certain restrictions and exclusions apply. Other warranty variations may be offered in your region.

**NOTE 2:** On-site service may be provided pursuant to a service contract between HP and an authorized HP third-party provider, and is not available in certain countries. Global service response times are based on commercially reasonable best effort and may vary by country.

**NOTE 3:** Technical telephone support applies only to HP-configured and third-party HP qualified hardware and software. Toll-free calling and 24 x 7 support may not be available in some countries.

**NOTE 4:** Service levels and response times for HP Care Packs may vary depending on your geographic location. Service starts on date of hardware purchase. Restrictions and limitations apply. For details, visit [www.hp.com/go/cpc](http://www.hp.com/go/cpc). HP services are governed by the applicable HP terms and conditions of service provided or indicated to Customer at the time of purchase. Customer may have additional statutory rights according to applicable local laws, and such rights are not in any way affected by the HP terms and conditions of service or the HP Limited Warranty provided with your HP Product.

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### Options & Accessories (availability may vary by region)

	<b>Part Number</b>
<b>MEMORY</b>	
HP 4GB DDR4-2666 SODIMM	3TK86AA
HP 8GB DDR4-2666 SODIMM	3TK88AA
HP 16GB DDR4-2666 SODIMM	3TK84AA
<b>DATA STORAGE DRIVES AND ACCESSORIES</b>	
HP 256GB SATA TLC Non-SED Solid State Drive	P1N68AA
HP PCIe NVME TLC 256GB SSD M.2 Drive	1CA51AA
HP PCIe NVME TLC 512GB SSD M.2 Drive	X8U75AA
<b>MULTIMEDIA DEVICES</b>	
HP Business Headset v2	T4E61AA
HP USB Business Speakers v2	N3R89AA
<b>INPUT DEVICES</b>	
HP USB Business Slim CCID SmartCard Keyboard	Z9H48AA
HP USB Business Slim (Grey) Keyboard (EMEA Only)	Z9H49AA
HP USB Business Slim Keyboard	N3R87AA
HP USB Collaboration Keyboard	Z9N38AA
HP USB Keyboard	QY776AA
HP USB Keyboard and Mouse Healthcare Edition	1VD81AA
HP USB Premium Keyboard	Z9N40AA
HP USB PS/2 Washable Keyboard & Mouse	BU207AA
HP Wireless Business Slim Keyboard and Mouse	N3R88AA
HP Wireless Collaboration Keyboard	Z9N39AA
HP USB Grey v2 Mouse (EMEA only)	Z9H74AA
HP USB Premium Mouse	1JR32AA
HP USB 1000dpi Laser Mouse	QY778AA
HP USB Hardened Mouse	P1N77AA
HP USB Mouse	QY777AA
*Keyboard contains 25% post-consumer recycled plastic material	
<b>SECURITY</b>	
HP Dual Head Keyed Cable Lock	T1A64AA
HP Keyed Cable Lock 10mm	T1A62AA
HP Master Keyed Cable Lock 10mm	T1A63AA

### Options & Accessories (availability may vary by region)

#### GRAPHICS – VIDEO ADAPTERS AND CABLES

	<b>Part Number</b>
HP DisplayPort To HDMI True 4k Adapter	2JA63AA
HP DVI Cable Kit	DC198A
HP HDMI Standard Cable Kit	T6F94AA
HP DisplayPort Cable Kit	VN567AA
HP DisplayPort To VGA Adapter	AS615AA
HP DisplayPort To DVI-D Adapter	FH973AA

#### STANDS AND ACCESSORIES

	<b>Part Number</b>
HP Desktop Mini G3 Port Cover Kit	1ZE52AA
HP G4 Mini 2.5-inch SATA Drive Bay Kit	3TK91AA
HP Desktop Mini LockBox V2	3EJ57AA
HP Desktop Mini 500GB HDD/I/O Expansion Module	K9Q82AA
HP Desktop Mini Security/Dual VESA Sleeve v2	2JA32AA
HP Desktop Mini Vertical Chassis Stand	G1K23AA
HP DM VESA Power Supply Holder Kit*	1RL87AA
HP B300 PC Mounting Bracket	2DW53AA
HP B500 PC Mounting Bracket	2DW52AA
HP Single Monitor Arm	BT861AA
<i>*Must use in conjunction with Dual VESA Sleeve V2</i>	

#### I/O DEVICES

	<b>Part Number</b>
HP DisplayPort Port Flex IO	3TK72AA
HP HDMI Port Flex IO (400/600/800)	3TK74AA
HP Type-C USB 3.1 Gen2 Port Flex IO	3TK78AA
HP VGA Port Flex IO	3TK80AA
HP Serial Port Flex IO	3TK76AA

#### INTEL OPTANE MEMORY

Intel Optane Memory 16GB (Cache)	1WV97AA
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### Technical Specifications – Processors

#### Intel® 8th Generation Core™ Processors

All HP MP9 G4 Retail System models featuring this technology include processors that are part of the Intel® Stable Image Platform Program (SIPP) designed to ensure the stability promise inherent in the value proposition of the HP MP9 G4 Retail System, thus making these models the most stable, secure, and manageable platforms available to enterprises today.

Intel® Advanced Management Technology (AMT) v12<sup>1</sup> – An advanced set of remote management features and functionality which provides network administrators the latest and most effective tools to remotely discover, heal, and protect networked client systems regardless of the system's health or power state. AMT 12 includes the following advanced management functions:

- Support for configuration of Intel AMT 12.0 new capabilities
- No reset after provisioning
- Support changes to BIOS table 130
- Support for Microsoft Windows Server 2012 R2
- Support for New Microsoft SQL Server Versions including Standard and Enterprise editions
- Support for Intel SSD Prop 2500 Series
- Support for Intel Enterprise Digital Fence
- The Platform Discovery Utility can now discover these additional Intel products:
  - Intel SSD Pro 2500 Series; Enterprise Digital Fence
  - Intel Identity Protection Technology with One Time Password; Public Key Infrastructure; Multi Factor Authentication
  - Intel Identity Protection Technology with Intel WiGig
  - New Profile Editor and Profile Editor Plugin Interface
  - New Required Permissions for Solutions Framework

1. Intel® Active Management Technology requires an Intel® AMT-enabled chipset, network hardware and software, as well as connection with a power source and a corporate network connection. Setup requires configuration by the purchaser and may require scripting with the management console or further integration into existing security frameworks to enable certain functionality. It may also require modifications of implementation of new business processes.

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### Technical Specifications – Graphics

## GRAPHICS

### Intel® HD Graphics (integrated)

<b>VGA Controller</b>	Integrated
<b>DisplayPort™ 1.2</b>	Multimode capable; supports HDCP (on standard DisplayPort and up to 1 optional port), Display Port Audio (2 streams), HBR2 link rates and Multi-Stream Technology for a maximum of 3 displays connected to any output controlled by Intel® Graphics
<b>HDMI (optional)</b>	Supports HDMI 2.0a features Supports HDCP 2.2 (on up to 1 HDMI port option) Supports BT2020 and HDR playback (7th Gen processors only)
<b>VGA (optional)</b>	VGA output
<b>USB-C™ DP Alt Mode (optional)</b>	DisplayPort over the optional USB-C™ module
<b>Memory</b>	The actual amount of maximum graphics memory can be >4GB. System memory is allocated for graphics as needed using Intel's Dynamic Video Memory Technology (DVMT), to provide an optimal balance between graphics and system memory use.
<b>Maximum Color Depth</b>	up to 10 bits/color
<b>Graphics/Video API Support</b>	HEVC 10b Enc/Dec HW VP9 10b Dec HW HDR Rec. 2020 DX12
<b>34" UHD Supported Resolutions and Refresh Rates. Other resolutions may also work.</b>	640x480 60 Hz 640x480 67Hz 640x480 72Hz 640x480 75Hz 720x400 70Hz 800x600 60Hz 800x600 75Hz 1024x768 60Hz 1024x768 75Hz 1280x960 60Hz 1280x720 60Hz 1280x1024 60Hz 1280x1024 75Hz 1440x900 60Hz 1440x900 75Hz 1680x1050 60Hz 1920x1080 60Hz 3440x1440 60Hz (Native Resolution) 3440x1440 30Hz

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### Technical Specifications – Storage

#### 500GB 7200RPM 2.5in SATA HDD

<b>Capacity</b>	500 GB
<b>Rotational Speed</b>	7,200 rpm
<b>Interface</b>	SATA 6 Gb/s
<b>Buffer Size</b>	16 MB
<b>Logical Blocks</b>	976,773,168
<b>Seek Time</b>	12 ms (Average)
<b>Height</b>	0.267 in/6.8 mm (nominal)
<b>Width (nominal)</b>	2.75 in/70 mm (nominal)
<b>Operating Temperature</b>	41° to 131° F (5° to 55° C)

\*For hard drives and solid state drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 36 GB (for Windows 10) of system disk is reserved for the system recovery software.

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#### 1TB 7200RPM 2.5in SATA HDD

<b>Capacity</b>	1 TB
<b>Rotational Speed</b>	7,200 rpm
<b>Interface</b>	SATA 6 Gb/s
<b>Buffer Size</b>	32 MB
<b>Logical Blocks</b>	1,953,525,168
<b>Seek Time</b>	12 ms (Average)
<b>Height</b>	0.374 in/9.5 mm (nominal)
<b>Width (nominal)</b>	2.75 in/70 mm (nominal)
<b>Operating Temperature</b>	41° to 131° F (5° to 55° C)

\*For hard drives and solid state drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 36 GB (for Windows 10) of system disk is reserved for the system recovery software.

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#### 2TB 5400RPM 2.5in SATA HDD

<b>Capacity</b>	2 TB
<b>Rotational Speed</b>	5,400 rpm
<b>Interface</b>	SATA 6.0 Gb/s
<b>Buffer Size</b>	128 MB
<b>Logical Blocks</b>	3,907,050,336
<b>Seek Time</b>	12 ms (Average)
<b>Height</b>	0.374 in/9.5 mm (nominal)
<b>Width (nominal)</b>	2.75 in/70 mm (nominal)

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### Technical Specifications – Storage

**Operating Temperature** 41° to 131° F (5° to 55° C)

\*For hard drives and solid state drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 36 GB (for Windows 10) of system disk is reserved for the system recovery software.

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#### 500GB 7200RPM 2.5in Self Encrypted OPAL2 SATA HDD

**Capacity** 500GB  
**Rotational Speed** Self-Encrypting (SED) Solid State Drive with SATA interface  
**Interface** SATA 6 Gb/s  
**Buffer Size** 32 MB  
**Logical Blocks** 976,773,168  
**Seek Time** 12 ms (Average)  
**Height** 0.267 in/6.8 mm (nominal)  
**Width (nominal)** 2.75 in/70 mm (nominal)  
**Operating Temperature** 41° to 131° F (5° to 55° C)

\*For hard drives and solid state drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 36 GB (for Windows 10) of system disk is reserved for the system recovery software.

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#### 500GB 7200RPM 2.5in Self Encrypted Federal Information Processing Standard SATA HDD

**Capacity** 500GB  
**Rotational Speed** Self-Encrypting (SED) Solid State Drive with SATA interface  
**Interface** SATA 6 Gb/s  
**Buffer Size** 32 MB  
**Logical Blocks** 976,773,168  
**Seek Time** 12 ms (Average)  
**Height** 0.267 in/6.8 mm (nominal)  
**Width (nominal)** 2.75 in/70 mm (nominal)  
**Operating Temperature** 41° to 131° F (5° to 55° C)

\*For hard drives and solid state drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 36 GB (for Windows 10) of system disk is reserved for the system recovery software.

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#### 500GB 5400RPM 2.5in SATA SSHD

**Capacity** 500GB  
**Rotational Speed** 5,400 rpm  
**Drive Type** Solid State Hybrid Drive (SSHD) technology with NAND Flash

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### Technical Specifications – Storage

<b>Interface</b>	SATA 6 Gb/s
<b>Buffer Size</b>	64 MB
<b>NAND Flash</b>	8GB
<b>Seek Time</b>	12 ms (Average)
<b>Height</b>	0.267 in/6.8 mm (nominal)
<b>Width (nominal)</b>	2.75 in/70 mm (nominal)
<b>Operating Temperature</b>	41° to 131° F (5° to 55° C)

\*For hard drives and solid state drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 36 GB (for Windows 10) of system disk is reserved for the system recovery software.

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#### 1TB 5400RPM 2.5in SATA SSHD

<b>Capacity</b>	1TB
<b>Rotational Speed</b>	5,400 rpm
<b>Drive Type</b>	Solid State Hybrid Drive (SSHD) technology with NAND Flash
<b>Interface</b>	SATA 6 Gb/s
<b>Buffer Size</b>	64 MB
<b>NAND Flash</b>	8GB
<b>Seek Time</b>	12 ms (Average)
<b>Height</b>	0.374 in/9.5 mm (nominal)
<b>Width (nominal)</b>	2.75 in/70 mm (nominal)
<b>Operating Temperature</b>	41° to 131° F (5° to 55° C)

\*For hard drives and solid state drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 36 GB (for Windows 10) of system disk is reserved for the system recovery software.

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#### 2TB 5400RPM 2.5in SATA SSHD

<b>Capacity</b>	2TB
<b>Rotational Speed</b>	5,400 rpm
<b>Drive Type</b>	Solid State Hybrid Drive (SSHD) technology with NAND Flash
<b>Interface</b>	SATA 6 Gb/s
<b>Buffer Size</b>	128 MB
<b>NAND Flash</b>	8GB
<b>Seek Time</b>	12 ms (Average)
<b>Height</b>	0.374 in/9.5 mm (nominal)
<b>Width (nominal)</b>	2.75 in/70 mm (nominal)
<b>Operating Temperature</b>	41° to 131° F (5° to 55° C)

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### Technical Specifications – Storage

\*For hard drives and solid state drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 36 GB (for Windows 10) of system disk is reserved for the system recovery software.

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#### 256GB 2.5in SATA Three Layer Cell SSD

<b>Drive Weight</b>	<62g
<b>Capacity</b>	256GB
<b>Height</b>	7mm
<b>Length</b>	100.45mm
<b>Width</b>	69.85mm
<b>Interface</b>	SATA 3.0 (6Gb/s)
<b>Performance</b>	Up to Random Read/Write = 55K/68K IOPS
<b>Maximum Sequential Read</b>	Up to 530MB/s
<b>Maximum Sequential Write</b>	Up to 450MB/s
<b>Logical Blocks</b>	500,118,192
<b>Operating Temperature</b>	0° to 70°C (32° to 158°F) [ambient temp]
<b>Features</b>	DIPM; TRIM

\*For hard drives and solid state drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 36 GB (for Windows 10) of system disk is reserved for the system recovery software.

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#### 512GB 2.5in SATA Three Layer Cell SSD

<b>Drive Weight</b>	<50g
<b>Capacity</b>	512GB
<b>Height</b>	7mm
<b>Length</b>	100.45mm
<b>Width</b>	69.85mm
<b>Interface</b>	SATA 3.0 (6Gb/s)
<b>Performance</b>	Up to Random Read/Write = 92K/83K IOPS
<b>Maximum Sequential Read</b>	Up to 530MB/s
<b>Maximum Sequential Write</b>	Up to 500MB/s
<b>Logical Blocks</b>	1,000,215,216
<b>Operating Temperature</b>	0° to 70°C (32° to 158°F) [ambient temp]
<b>Features</b>	DIPM; TRIM

\*For hard drives and solid state drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 36 GB (for Windows 10) of system disk is reserved for the system recovery software.

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*Technical Specifications – Storage***256GB 2.5in SATA Self Encrypted Federal Information Processing Standard SSD**

<b>Drive Weight</b>	<40g
<b>Capacity</b>	256GB
<b>Height</b>	7mm
<b>Length</b>	100.45mm
<b>Width</b>	69.85mm
<b>Interface</b>	SATA 3.0 (6Gb/s)
<b>Performance</b>	Up to Random Read/Write = 55K/83K IOPS
<b>Maximum Sequential Read</b>	Up to 530MB/s
<b>Maximum Sequential Write</b>	Up to 500MB/s
<b>Logical Blocks</b>	500,118,192
<b>Operating Temperature</b>	0° to 70°C (32° to 158°F) [ambient temp]
<b>Features</b>	DIPM; TRIM; FIPS 140-2 security

\*For hard drives and solid state drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 36 GB (for Windows 10) of system disk is reserved for the system recovery software.

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**512GB 2.5in SATA Self Encrypted Federal Information Processing Standard SSD**

<b>Drive Weight</b>	<45g
<b>Capacity</b>	512GB
<b>Height</b>	7mm
<b>Length</b>	100.45mm
<b>Width</b>	69.85mm
<b>Interface</b>	SATA 3.0 (6Gb/s)
<b>Performance</b>	Up to Random Read/Write = 92K/83K IOPS
<b>Maximum Sequential Read</b>	Up to 530MB/s
<b>Maximum Sequential Write</b>	Up to 500MB/s
<b>Logical Blocks</b>	1,000,215,216
<b>Operating Temperature</b>	0° to 70°C (32° to 158°F) [ambient temp]
<b>Features</b>	DIPM; TRIM; FIPS 140-2 security

\*For hard drives and solid state drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 36 GB (for Windows 10) of system disk is reserved for the system recovery software.

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**128GB M.2 2280 PCIe NVMe SSD**

<b>Drive Weight</b>	< 10g
<b>Capacity</b>	128GB

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### Technical Specifications – Storage

<b>Height</b>	2.38mm
<b>Length</b>	80mm
<b>Width</b>	22mm
<b>Interface</b>	PCIe Gen3
<b>Performance</b>	Up to Random Read/Write = 60K/50K IOPS
<b>Maximum Sequential Read</b>	Up to 1400MB/s
<b>Maximum Sequential Write</b>	Up to 395MB/s
<b>Logical Blocks</b>	250,069,680
<b>Operating Temperature</b>	0° to 70°C (32° to 158°F) [ambient temp]
<b>Features</b>	APST; ASPM L1.2; NVME spec 1.2

\*For hard drives and solid state drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 36 GB (for Windows 10) of system disk is reserved for the system recovery software.

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#### 256GB M.2 2280 PCIe NVMe SSD

<b>Drive Weight</b>	< 10g
<b>Capacity</b>	256GB
<b>Height</b>	2.38mm
<b>Length</b>	80mm
<b>Width</b>	22mm
<b>Interface</b>	PCIe Gen3
<b>Performance</b>	Up to Random Read/Write = 120K/170K IOPS
<b>Maximum Sequential Read</b>	Up to 1600MB/s
<b>Maximum Sequential Write</b>	Up to 780MB/s
<b>Logical Blocks</b>	500,118,192
<b>Operating Temperature</b>	0° to 70°C (32° to 158°F) [ambient temp]
<b>Features</b>	APST; ASPM L1.2; NVME spec 1.2

\*For hard drives and solid state drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 36 GB (for Windows 10) of system disk is reserved for the system recovery software.

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#### 512GB M.2 2280 PCIe NVMe SSD

<b>Drive Weight</b>	< 10g
<b>Capacity</b>	512GB
<b>Height</b>	2.38mm
<b>Length</b>	80mm
<b>Width</b>	22mm

### Technical Specifications – Storage

<b>Interface</b>	PCIe Gen3
<b>Performance</b>	Up to Random Read/Write = 200K/180K IOPS
<b>Maximum Sequential Read</b>	Up to 1600MB/s
<b>Maximum Sequential Write</b>	Up to 860MB/s
<b>Logical Blocks</b>	1,000,215,216
<b>Operating Temperature</b>	0° to 70°C (32° to 158°F) [ambient temp]
<b>Features</b>	APST; ASPM L1.2; NVME spec 1.2

\*For hard drives and solid state drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 36 GB (for Windows 10) of system disk is reserved for the system recovery software.

### 128GB M.2 2280 PCIe NVMe Three Layer Cell SSD

<b>Drive Weight</b>	< 10g
<b>Capacity</b>	128GB
<b>Height</b>	2.38mm
<b>Length</b>	80mm
<b>Width</b>	22mm
<b>Interface</b>	PCIe Gen3
<b>Performance</b>	Up to Random Read/Write = 140K/40K IOPS
<b>Maximum Sequential Read</b>	Up to 2800MB/s
<b>Maximum Sequential Write</b>	Up to 600MB/s
<b>Logical Blocks</b>	250,069,680
<b>Operating Temperature</b>	0° to 70°C (32° to 158°F) [ambient temp]
<b>Features</b>	APST; ASPM L1.2; NVME spec 1.2

\*For hard drives and solid state drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 36 GB (for Windows 10) of system disk is reserved for the system recovery software.

### 256GB M.2 2280 PCIe NVMe Three Layer Cell SSD

<b>Drive Weight</b>	< 10g
<b>Capacity</b>	256GB
<b>Height</b>	2.38mm
<b>Length</b>	80mm
<b>Width</b>	22mm
<b>Interface</b>	PCIe Gen3x4
<b>Performance</b>	Up to Random Read/Write = 150K/180K IOPS
<b>Maximum Sequential Read</b>	Up to 2700MB/s

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### Technical Specifications – Storage

<b>Maximum Sequential Write</b>	Up to 1000MB/s
<b>Logical Blocks</b>	500,118,192
<b>Operating Temperature</b>	0° to 70°C (32° to 158°F) [ambient temp]
<b>Features</b>	APST; ASPM L1.2; NVME spec 1.2

\*For hard drives and solid state drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 36 GB (for Windows 10) of system disk is reserved for the system recovery software.

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#### 512GB M.2 2280 PCIe NVMe Three Layer Cell SSD

<b>Drive Weight</b>	< 10g
<b>Capacity</b>	512GB
<b>Height</b>	2.38mm
<b>Length</b>	80mm
<b>Width</b>	22mm
<b>Interface</b>	PCIe Gen3x4
<b>Performance</b>	Up to Random Read/Write = 270K/235K IOPS
<b>Maximum Sequential Read</b>	Up to 2900MB/s
<b>Maximum Sequential Write</b>	Up to 1100MB/s
<b>Logical Blocks</b>	1,000,215,216
<b>Operating Temperature</b>	0° to 70°C (32° to 158°F) [ambient temp]
<b>Features</b>	APST; ASPM L1.2; NVME spec 1.2

\*For hard drives and solid state drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 36 GB (for Windows 10) of system disk is reserved for the system recovery software.

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#### 1TB M.2 2280 PCIe NVMe Three Layer Cell SSD

<b>Drive Weight</b>	< 10g
<b>Capacity</b>	1TB
<b>Height</b>	2.38mm
<b>Length</b>	80mm
<b>Width</b>	22mm
<b>Interface</b>	PCIe Gen3x4
<b>Performance</b>	Up to Random Read/Write = 290K/240K IOPS
<b>Maximum Sequential Read</b>	Up to 2900MB/s
<b>Maximum Sequential Write</b>	Up to 2100MB/s
<b>Logical Blocks</b>	2,000,409,264
<b>Operating Temperature</b>	0° to 70°C (32° to 158°F) [ambient temp]



### Technical Specifications – Storage

**Features** APST; ASPM L1.2; NVME spec 1.2

\*For hard drives and solid state drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 36 GB (for Windows 10) of system disk is reserved for the system recovery software.

#### 256GB M.2 2280 PCIe NVMe Self Encrypted OPAL2 Three Layer Cell SSD

**Drive Weight** < 10g  
**Capacity** 256GB  
**Height** 2.38mm  
**Length** 80mm  
**Width** 22mm  
**Interface** PCIE Gen3x4  
**Performance** Up to Random Read/Write = 150K/180K IOPS  
**Maximum Sequential Read** Up to 2700MB/s  
**Maximum Sequential Write** Up to 1000MB/s  
**Logical Blocks** 500,118,192  
**Operating Temperature** 0° to 70°C (32° to 158°F) [ambient temp]  
**Features** APST; ASPM L1.2; NVME spec 1.2; TCG-OPAL2 security

\*For hard drives and solid state drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 36 GB (for Windows 10) of system disk is reserved for the system recovery software.

#### 512GB M.2 2280 PCIe NVMe Self Encrypted OPAL2 Three Layer Cell SSD

**Drive Weight** < 10g  
**Capacity** 512GB  
**Height** 2.38mm  
**Length** 80mm  
**Width** 22mm  
**Interface** PCIE Gen3x4  
**Performance** Up to Random Read/Write = 270K/235K IOPS  
**Maximum Sequential Read** Up to 2900MB/s  
**Maximum Sequential Write** Up to 1100MB/s  
**Logical Blocks** 1,000,215,216  
**Operating Temperature** 0° to 70°C (32° to 158°F) [ambient temp]  
**Features** APST; ASPM L1.2; NVME spec 1.2; TCG-OPAL2 security

\*For hard drives and solid state drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 36 GB (for Windows 10) of system disk is reserved for the system recovery software.

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 Technical Specifications – Storage
 

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**NETWORKING AND COMMUNICATIONS**
**Intel® I219-LM Gigabit Network Connection (standard)**

<b>Connector</b>	RJ-45
<b>System Interface</b>	PCI(Intel proprietary) + SMBus
<b>Data rates supported</b>	10 Mbit/s operation (10BASE-T; IEEE 802.3i; IEEE 802.3 clauses 13-14) 100 Mbit/s operation (100BASE-TX; IEEE 802.3u; IEEE 802.3 clauses 21-30) 1000 Mbit/s operation (1000BASE-T; IEEE 802.3ab; IEEE 8023 clauses 40) Auto-Negotiation (Automatic Speed Selection) Full Duplex Operation at all Speeds, Half Duplex operation at 10 and 100 Mbit/s
<b>IEEE Compliance</b>	IEEE 802.1p QoS (Quality of Service) Support IEEE 802.1q VLAN support IEEE 802.3x Flow Control (IEEE 802.3 clauses 31-32; configurable) IEEE 802.3az EEE (Energy Efficient Ethernet)
<b>Performance</b>	TCP/IP/UDP Checksum Offload (configurable) Protocol Offload (ARP & NS) Large send offload and Giant send offload Receiving Side Scaling Jumbo Frame 9K
<b>Power consumption</b>	Cable Disconnection: 25mW 100Mbps Full Run: 450mW 1000bp Full Run: 1000mW WoL Enable(S3/S4/S5): 50mW WoL Disable(S3/S4/S5): 25mW
<b>Power Management</b>	ACPI compliant – multiple power modes Situation-sensitive features reduce power consumption Advanced link down power saving for reducing link down power consumption
<b>Management Interface</b>	Auto MDI/MDIX Crossover cable detection
<b>IT Manageability</b>	Wake-on-LAN from standby and hibernation (Magic Packet and Microsoft Wake-Up Frame); Wake-on-LAN from off (Magic Packet only) PXE 2.1 Remote Boot Statistics Gathering (SNMP MIB II, Ethernet-like MIB, Ethernet MIB (802.3x, clause 30)) Comprehensive diagnostic and configuration software suite Virtual Cable Doctor for Ethernet cable status
<b>Security &amp; Manageability</b>	Intel® vPro™ support with appropriate Intel® chipset components

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### Technical Specifications – Networking and Communications

#### Intel® 9560 802.11ac 2x2 with Bluetooth® M.2 Combo Card vPro™

<b>Wireless LAN Standards</b>	IEEE 802.11a IEEE 802.11b IEEE 802.11g IEEE 802.11n IEEE 802.11ac
<b>Interoperability</b>	Wi-Fi certified
<b>Frequency Band</b>	802.11b/g/n • 2.402 – 2.482 GHz 802.11a/n • 4.9 – 4.95 GHz (Japan) • 5.15 – 5.25 GHz • 5.25 – 5.35 GHz • 5.47 – 5.725 GHz • 5.825 – 5.850 GHz
<b>Data Rates</b>	802.11b: 1, 2, 5.5, 11 Mbps 802.11g: 6, 9, 12, 18, 24, 36, 48, 54 Mbps 802.11a: 6, 9, 12, 18, 24, 36, 48, 54 Mbps 802.11n: MCS 0 ~ MCS 15, (20MHz, and 40MHz) 802.11ac : MCS0 ~ MCS9, (1SS, and 2SS) (20MHz, 40MHz, ,80MHz & 160MHz)
<b>Modulation</b>	Direct Sequence Spread Spectrum BPSK, QPSK, CCK, 16-QAM, 64-QAM, 256-QAM
<b>Security</b>	IEEE and WiFi compliant 64 / 128 bit WEP encryption for a/b/g mode only AES-CCMP: 128 bit in hardware 802.1x authentication WPA, WPA2: 802.1x. WPA-PSK, WPA2-PSK, TKIP, and AES. WPA2 certification IEEE 802.11i Cisco Certified Extensions, all versions through CCX4 and CCX Lite WAPI
<b>Network Architecture Models</b>	Ad-hoc (Peer to Peer) Infrastructure (Access Point Required)
<b>Roaming</b>	IEEE 802.11 compliant roaming between access points
<b>Output Power</b>	• 802.11b : +18.5dBm minimum • 802.11g : +17.5dBm minimum • 802.11a : +18.5dBm minimum • 802.11n HT20(2.4GHz) : +15.5dBm minimum • 802.11n HT40(2.4GHz) : +14.5dBm minimum • 802.11n HT20(5GHz) : +15.5dBm minimum • 802.11n HT40(5GHz) : +14.5dBm minimum • 802.11ac VHT80(5GHz) : +11.5dBm minimum • 802.11ac VHT160(5GHz) : +11.5dBm minimum
<b>Power Consumption</b>	Transmit mode 2.0 W Receive mode 1.6 W Idle mode (PSP) 180 mW (WLAN Associated) Idle mode 50 mW (WLAN unassociated) Connected Standby 10mW Radio disabled 8 mW
<b>Power Management</b>	ACPI and PCI Express compliant power management 802.11 compliant power saving mode

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**Technical Specifications – Networking and Communications**

<b>Receiver Sensitivity</b>	802.11b, 1Mbps : -93.5dBm maximum 802.11b, 11Mbps : -84dBm maximum 802.11a/g, 6Mbps : -86dBm maximum 802.11a/g, 54Mbps : -72dBm maximum 802.11n, MCS07 : -67dBm maximum 802.11n, MCS15 : -64dBm maximum 802.11ac, MCS0 : -84dBm maximum 802.11ac, MCS9 : -59dBm maximum
<b>Antenna type</b>	High efficiency antenna with spatial diversity, mounted in the display enclosure  Two embedded dual band 2.4/5 GHz antennas are provided to the card to support WLAN MIMO communications and Bluetooth communications
<b>Form Factor</b>	PCI-Express M.2 MiniCard
<b>Dimensions</b>	Type 2230 : 2.3 x 22.0 x 30.0 mm
<b>Weight</b>	Type 2230 : 2.8g
<b>Operating Voltage</b>	3.3v +/- 9%
<b>Temperature</b>	Operating: 14° to 158° F (-10° to 70° C) Non-operating: -40° to 176° F (-40° to 80° C)
<b>Humidity</b>	Operating: 10% to 90% (non-condensing) Non-operating: 5% to 95% (non-condensing)
<b>Altitude</b>	Operating: 0 to 10,000 ft (3,048 m) Non-operating: 0 to 50,000 ft (15,240 m)
<b>LED Activity</b>	LED Amber – Radio OFF; LED White – Radio ON
<b>HP Integrated Module with Bluetooth 4.0/4.1/4.2/5.0 Wireless Technology</b>	
<b>Bluetooth Specification</b>	4.0/4.1/4.2/5.0 Compliant
<b>Frequency Band</b>	2402 to 2480 MHz
<b>Number of Available Channels</b>	Legacy : 0~79 (1 MHz/CH) BLE : 0~39 (2 MHz/CH)
<b>Data Rates and Throughput</b>	Legacy : 3 Mbps data rate; throughput up to 2.17 Mbps BLE : 1 Mbps data rate; throughput up to 0.2 Mbps Legacy : Synchronous Connection Oriented links up to 3, 64 kbps, voice channels Legacy : Asynchronous Connection Less links 2178.1 kbps/177.1 kbps asymmetric (3-DH5) or 864 kbps symmetric (3-EV5)
<b>Transmit Power</b>	The Bluetooth component shall operate as a Class II Bluetooth device with a maximum transmit power of + 4 dBm for BR and EDR.
<b>Power Consumption</b>	Peak (Tx) 330 mW Peak (Rx) 230 mW Selective Suspend 17 mW
<b>Bluetooth Software Supported Link Topology</b>	Microsoft Windows Bluetooth Software
<b>Power Management</b>	Microsoft Windows ACPI, and USB Bus Support
<b>Certifications</b>	FCC (47 CFR) Part 15C, Section 15.247 & 15.249
<b>Power Management Certifications</b>	ETS 300 328, ETS 300 826 Low Voltage Directive IEC950 UL, CSA, and CE Mark
<b>Bluetooth Profiles Supported</b>	BT4.1-ESR 5/6/7 Compliance LE Link Layer Ping LE Dual Mode

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### *Technical Specifications – Networking and Communications*

- LE Link Layer
- LE Low Duty Cycle Directed Advertising
- LE L2CAP Connection Oriented Channels
- Train Nudging & Interlaced Scan
- BT4.2 ESR08 Compliance
- LE Secure Connection- Basic/Full
- LE Privacy 1.2 –Link Layer Privacy
- LE Privacy 1.2 –Extended Scanner Filter Policies
- LE Data Packet Length Extension
- FAX Profile (FAX)
- Basic Imaging Profile (BIP)2
- Headset Profile (HSP)
- Hands Free Profile (HFP)
- Advanced Audio Distribution Profile (A2DP)

#### **Security & Manageability**

Intel® vPro™ support with appropriate Intel® chipset components

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### Technical Specifications – Networking and Communications

#### Intel® 9560 802.11ac 2x2 with Bluetooth® M.2 Combo Card non-vPro™

<b>Wireless LAN Standards</b>	IEEE 802.11a IEEE 802.11b IEEE 802.11g IEEE 802.11n IEEE 802.11ac
<b>Interoperability</b>	Wi-Fi certified
<b>Frequency Band</b>	802.11b/g/n • 2.402 – 2.482 GHz 802.11a/n • 4.9 – 4.95 GHz (Japan) • 5.15 – 5.25 GHz • 5.25 – 5.35 GHz • 5.47 – 5.725 GHz • 5.825 – 5.850 GHz
<b>Data Rates</b>	802.11b: 1, 2, 5.5, 11 Mbps 802.11g: 6, 9, 12, 18, 24, 36, 48, 54 Mbps 802.11a: 6, 9, 12, 18, 24, 36, 48, 54 Mbps 802.11n: MCS 0 ~ MCS 15, (20MHz, and 40MHz) 802.11ac : MCS0 ~ MCS9, (1SS, and 2SS) (20MHz, 40MHz, , 80MHz & 160MHz)
<b>Modulation</b>	Direct Sequence Spread Spectrum  BPSK, QPSK, CCK, 16-QAM, 64-QAM, 256-QAM
<b>Security</b>	IEEE and WiFi compliant 64 / 128 bit WEP encryption for a/b/g mode only AES-CCMP: 128 bit in hardware 802.1x authentication WPA, WPA2: 802.1x. WPA-PSK, WPA2-PSK, TKIP, and AES. WPA2 certification IEEE 802.11i Cisco Certified Extensions, all versions through CCX4 and CCX Lite WAPI
<b>Network Architecture Models</b>	Ad-hoc (Peer to Peer)  Infrastructure (Access Point Required)
<b>Roaming</b>	IEEE 802.11 compliant roaming between access points
<b>Output Power</b>	• 802.11b : +18.5dBm minimum • 802.11g : +17.5dBm minimum • 802.11a : +18.5dBm minimum • 802.11n HT20(2.4GHz) : +15.5dBm minimum • 802.11n HT40(2.4GHz) : +14.5dBm minimum • 802.11n HT20(5GHz) : +15.5dBm minimum • 802.11n HT40(5GHz) : +14.5dBm minimum • 802.11ac VHT80(5GHz) : +11.5dBm minimum • 802.11ac VHT160(5GHz) : +11.5dBm minimum
<b>Power Consumption</b>	Transmit mode 2.0 W Receive mode 1.6 W Idle mode (PSP) 180 mW (WLAN Associated) Idle mode 50 mW (WLAN unassociated) Connected Standby 10mW Radio disabled 8 mW

### Technical Specifications – Networking and Communications

<b>Power Management</b>	ACPI and PCI Express compliant power management 802.11 compliant power saving mode
<b>Receiver Sensitivity</b>	802.11b, 1Mbps : -93.5dBm maximum 802.11b, 11Mbps : -84dBm maximum 802.11a/g, 6Mbps : -86dBm maximum 802.11a/g, 54Mbps : -72dBm maximum 802.11n, MCS07 : -67dBm maximum 802.11n, MCS15 : -64dBm maximum 802.11ac, MCS0 : -84dBm maximum 802.11ac, MCS9 : -59dBm maximum
<b>Antenna type</b>	High efficiency antenna with spatial diversity, mounted in the display enclosure  Two embedded dual band 2.4/5 GHz antennas are provided to the card to support WLAN MIMO communications and Bluetooth communications
<b>Form Factor</b>	PCI-Express M.2 MiniCard
<b>Dimensions</b>	Type 2230 : 2.3 x 22.0 x 30.0 mm
<b>Weight</b>	Type 2230 : 2.8g
<b>Operating Voltage</b>	3.3v +/- 9%
<b>Temperature</b>	Operating: 14° to 158° F (-10° to 70° C) Non-operating: -40° to 176° F (-40° to 80° C)
<b>Humidity</b>	Operating: 10% to 90% (non-condensing) Non-operating: 5% to 95% (non-condensing)
<b>Altitude</b>	Operating: 0 to 10,000 ft (3,048 m) Non-operating: 0 to 50,000 ft (15,240 m)
<b>LED Activity</b>	LED Amber – Radio OFF; LED White – Radio ON
<b>HP Integrated Module with Bluetooth 4.0/4.1/4.2/5.0 Wireless Technology</b>	
<b>Bluetooth Specification</b>	4.0/4.1/4.2/5.0 Compliant
<b>Frequency Band</b>	2402 to 2480 MHz
<b>Number of Available Channels</b>	Legacy : 0~79 (1 MHz/CH) BLE : 0~39 (2 MHz/CH)
<b>Data Rates and Throughput</b>	Legacy : 3 Mbps data rate; throughput up to 2.17 Mbps BLE : 1 Mbps data rate; throughput up to 0.2 Mbps Legacy : Synchronous Connection Oriented links up to 3, 64 kbps, voice channels Legacy : Asynchronous Connection Less links 2178.1 kbps/177.1 kbps asymmetric (3-DH5) or 864 kbps symmetric (3-EV5)
<b>Transmit Power</b>	The Bluetooth component shall operate as a Class II Bluetooth device with a maximum transmit power of + 4 dBm for BR and EDR.
<b>Power Consumption</b>	Peak (Tx) 330 mW Peak (Rx) 230 mW Selective Suspend 17 mW
<b>Bluetooth Software Supported Link Topology</b>	Microsoft Windows Bluetooth Software
<b>Power Management</b>	Microsoft Windows ACPI, and USB Bus Support
<b>Certifications</b>	FCC (47 CFR) Part 15C, Section 15.247 & 15.249
<b>Power Management Certifications</b>	ETS 300 328, ETS 300 826 Low Voltage Directive IEC950 UL, CSA, and CE Mark

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### Technical Specifications – Networking and Communications

<b>Bluetooth Profiles Supported</b>	<ul style="list-style-type: none"> <li>BT4.1-ESR 5/6/7 Compliance</li> <li>LE Link Layer Ping</li> <li>LE Dual Mode</li> <li>LE Link Layer</li> <li>LE Low Duty Cycle Directed Advertising</li> <li>LE L2CAP Connection Oriented Channels</li> <li>Train Nudging &amp; Interlaced Scan</li> <li>BT4.2 ESR08 Compliance</li> <li>LE Secure Connection- Basic/Full</li> <li>LE Privacy 1.2 –Link Layer Privacy</li> <li>LE Privacy 1.2 –Extended Scanner Filter Policies</li> <li>LE Data Packet Length Extension</li> <li>FAX Profile (FAX)</li> <li>Basic Imaging Profile (BIP)2</li> <li>Headset Profile (HSP)</li> <li>Hands Free Profile (HFP)</li> <li>Advanced Audio Distribution Profile (A2DP)</li> </ul>
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### Realtek RTL8822BE 802.11ac 2x2 with Bluetooth® M.2 Combo Card

<b>Wireless LAN Standards</b>	<ul style="list-style-type: none"> <li>IEEE 802.11a</li> <li>IEEE 802.11b</li> <li>IEEE 802.11g</li> <li>IEEE 802.11n</li> <li>IEEE 802.11ac</li> </ul>
<b>Interoperability</b>	Wi-Fi certified
<b>Frequency Band</b>	<ul style="list-style-type: none"> <li>802.11b/g/n</li> <li>• 2.402 – 2.482 GHz</li> <li>802.11a/n</li> <li>• 4.9 – 4.95 GHz (Japan)</li> <li>• 5.15 – 5.25 GHz</li> <li>• 5.25 – 5.35 GHz</li> <li>• 5.47 – 5.725 GHz</li> <li>• 5.825 – 5.850 GHz</li> </ul>
<b>Data Rates</b>	<ul style="list-style-type: none"> <li>802.11b: 1, 2, 5.5, 11 Mbps</li> <li>802.11g: 6, 9, 12, 18, 24, 36, 48, 54 Mbps</li> <li>802.11a: 6, 9, 12, 18, 24, 36, 48, 54 Mbps</li> <li>802.11n: MCS 0 ~ MCS 15, (20MHz, and 40MHz)</li> <li>802.11ac : MCS0 ~ MCS9, (1SS, and 2SS) (20MHz, 40MHz, and 80MHz)</li> </ul>
<b>Modulation</b>	Direct Sequence Spread Spectrum
<b>Security</b>	<ul style="list-style-type: none"> <li>BPSK, QPSK, CCK, 16-QAM, 64-QAM, 256-QAM</li> <li>IEEE and WiFi compliant 64 / 128 bit WEP encryption for a/b/g mode only</li> <li>AES-CCMP: 128 bit in hardware</li> <li>802.1x authentication</li> <li>WPA, WPA2: 802.1x. WPA-PSK, WPA2-PSK, TKIP, and AES.</li> <li>WPA2 certification</li> <li>IEEE 802.11i</li> </ul>



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**Technical Specifications – Networking and Communications**

	Cisco Certified Extensions, all versions through CCX4 and CCX Lite WAPI
<b>Network Architecture Models</b>	Ad-hoc (Peer to Peer)  Infrastructure (Access Point Required)
<b>Roaming</b>	IEEE 802.11 compliant roaming between access points
<b>Output Power</b>	<ul style="list-style-type: none"> <li>• 802.11b : +14dBm minimum</li> <li>• 802.11g : +12dBm minimum</li> <li>• 802.11a : +12dBm minimum</li> <li>• 802.11n HT20(2.4GHz) : +12dBm minimum</li> <li>• 802.11n HT40(2.4GHz) : +12dBm minimum</li> <li>• 802.11n HT20(5GHz) : +10dBm minimum</li> <li>• 802.11n HT40(5GHz) : +10dBm minimum</li> <li>• 802.11ac VHT80(5GHz) : +10dBm minimum</li> </ul>
<b>Power Consumption</b>	Transmit mode 2.0 W Receive mode 1.6 W Idle mode (PSP) 180 mW (WLAN Associated) Idle mode 50 mW (WLAN unassociated) Connected Standby 10mW Radio disabled 8 mW
<b>Power Management</b>	ACPI and PCI Express compliant power management 802.11 compliant power saving mode
<b>Receiver Sensitivity</b>	802.11b, 1Mbps : -93.5dBm maximum 802.11b, 11Mbps : -84dBm maximum 802.11a/g, 6Mbps : -86dBm maximum 802.11a/g, 54Mbps : -72dBm maximum 802.11n, MCS07 : -67dBm maximum 802.11n, MCS15 : -64dBm maximum 802.11ac, MCS0 : -84dBm maximum 802.11ac, MCS9 : -59dBm maximum
<b>Antenna type</b>	High efficiency antenna with spatial diversity, mounted in the display enclosure
	Two embedded dual band 2.4/5 GHz antennas are provided to the card to support WLAN MIMO communications and Bluetooth communications
<b>Form Factor</b>	PCI-Express M.2 MiniCard
<b>Dimensions</b>	Type 2230 : 2.3 x 22.0 x 30.0 mm
<b>Weight</b>	Type 2230 : 2.8g
<b>Operating Voltage</b>	3.3v +/- 9%
<b>Temperature</b>	Operating: 14° to 158° F (-10° to 70° C) Non-operating: -40° to 176° F (-40° to 80° C)
<b>Humidity</b>	Operating: 10% to 90% (non-condensing) Non-operating: 5% to 95% (non-condensing)
<b>Altitude</b>	Operating: 0 to 10,000 ft (3,048 m) Non-operating: 0 to 50,000 ft (15,240 m)
<b>LED Activity</b>	LED Amber – Radio OFF; LED White – Radio ON
<b>HP Integrated Module with Bluetooth 4.0/4.1/4.2 Wireless Technology</b>	
<b>Bluetooth Specification</b>	4.0/4.1/4.2 Compliant
<b>Frequency Band</b>	2402 to 2480 MHz

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### Technical Specifications – Networking and Communications

<b>Number of Available Channels</b>	Legacy : 0~79 (1 MHz/CH) BLE : 0~39 (2 MHz/CH)
<b>Data Rates and Throughput</b>	Legacy : 3 Mbps data rate; throughput up to 2.17 Mbps BLE : 1 Mbps data rate; throughput up to 0.2 Mbps Legacy : Synchronous Connection Oriented links up to 3, 64 kbps, voice channels Legacy : Asynchronous Connection Less links 2178.1 kbps/177.1 kbps asymmetric (3-DH5) or 864 kbps symmetric (3-EV5)
<b>Transmit Power</b>	The Bluetooth component shall operate as a Class II Bluetooth device with a maximum transmit power of + 4 dBm for BR and EDR.
<b>Power Consumption</b>	Peak (Tx) 330 mW Peak (Rx) 230 mW Selective Suspend 17 mW
<b>Electrical Interface</b>	USB 2.0 compliant
<b>Bluetooth Software Supported Link Topology</b>	Microsoft Windows Bluetooth Software
<b>Power Management</b>	Microsoft Windows ACPI, and USB Bus Support
<b>Certifications</b>	FCC (47 CFR) Part 15C, Section 15.247 & 15.249
<b>Power Management Certifications</b>	ETS 300 328, ETS 300 826 Low Voltage Directive IEC950 UL, CSA, and CE Mark
<b>Bluetooth Profiles Supported</b>	BT4.1-ESR 5/6/7 Compliance LE Link Layer Ping LE Dual Mode LE Link Layer LE Low Duty Cycle Directed Advertising LE L2CAP Connection Oriented Channels Train Nudging & Interlaced Scan BT4.2 ESR08 Compliance LE Secure Connection- Basic/Full LE Privacy 1.2 –Link Layer Privacy LE Privacy 1.2 –Extended Scanner Filter Policies LE Data Packet Length Extension FAX Profile (FAX) Basic Imaging Profile (BIP)2 Headset Profile (HSP) Hands Free Profile (HFP) Advanced Audio Distribution Profile (A2DP)

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### Realtek RTL8821CE 802.11ac 1x1 with Bluetooth® M.2 Combo Card

<b>Wireless LAN Standards</b>	IEEE 802.11a IEEE 802.11b IEEE 802.11g IEEE 802.11n IEEE 802.11ac
<b>Interoperability</b>	Wi-Fi certified
<b>Frequency Band</b>	802.11b/g/n • 2.402 – 2.482 GHz

### Technical Specifications – Networking and Communications

	<p>802.11a/n</p> <ul style="list-style-type: none"> <li>• 4.9 – 4.95 GHz (Japan)</li> <li>• 5.15 – 5.25 GHz</li> <li>• 5.25 – 5.35 GHz</li> <li>• 5.47 – 5.725 GHz</li> <li>• 5.825 – 5.850 GHz</li> </ul>
<b>Data Rates</b>	<p>802.11b: 1, 2, 5.5, 11 Mbps</p> <p>802.11g: 6, 9, 12, 18, 24, 36, 48, 54 Mbps</p> <p>802.11a: 6, 9, 12, 18, 24, 36, 48, 54 Mbps</p> <p>802.11n: MCS 0 ~ MCS 15, (20MHz, and 40MHz)</p> <p>802.11ac : MCS0 ~ MCS9, (1SS, and 2SS) (20MHz, 40MHz, and 80MHz)</p>
<b>Modulation</b>	Direct Sequence Spread Spectrum
<b>Security</b>	<p>BPSK, QPSK, CCK, 16-QAM, 64-QAM, 256-QAM</p> <p>IEEE and WiFi compliant 64 / 128 bit WEP encryption for a/b/g mode only</p> <p>AES-CCMP: 128 bit in hardware</p> <p>802.1x authentication</p> <p>WPA, WPA2: 802.1x. WPA-PSK, WPA2-PSK, TKIP, and AES.</p> <p>WPA2 certification</p> <p>IEEE 802.11i</p> <p>Cisco Certified Extensions, all versions through CCX4 and CCX Lite</p> <p>WAPI</p>
<b>Network Architecture Models</b>	<p>Ad-hoc (Peer to Peer)</p> <p>Infrastructure (Access Point Required)</p>
<b>Roaming</b>	IEEE 802.11 compliant roaming between access points
<b>Output Power</b>	<ul style="list-style-type: none"> <li>• 802.11b : +14dBm minimum</li> <li>• 802.11g : +12dBm minimum</li> <li>• 802.11a : +12dBm minimum</li> <li>• 802.11n HT20(2.4GHz) : +12dBm minimum</li> <li>• 802.11n HT40(2.4GHz) : +12dBm minimum</li> <li>• 802.11n HT20(5GHz) : +10dBm minimum</li> <li>• 802.11n HT40(5GHz) : +10dBm minimum</li> <li>• 802.11ac VHT80(5GHz) : +10dBm minimum</li> </ul>
<b>Power Consumption</b>	<p>Transmit mode 2.0 W</p> <p>Receive mode 1.6 W</p> <p>Idle mode (PSP) 180 mW (WLAN Associated)</p> <p>Idle mode 50 mW (WLAN unassociated)</p> <p>Connected Standby 10mW</p> <p>Radio disabled 8 mW</p>
<b>Power Management</b>	<p>ACPI and PCI Express compliant power management</p> <p>802.11 compliant power saving mode</p>
<b>Receiver Sensitivity</b>	<p>802.11b, 1Mbps : -93.5dBm maximum</p> <p>802.11b, 11Mbps : -84dBm maximum</p> <p>802.11a/g, 6Mbps : -86dBm maximum</p> <p>802.11a/g, 54Mbps : -72dBm maximum</p> <p>802.11n, MCS07 : -67dBm maximum</p> <p>802.11n, MCS15 : -64dBm maximum</p> <p>802.11ac, MCS0 : -84dBm maximum</p> <p>802.11ac, MCS9 : -59dBm maximum</p>

**Technical Specifications – Networking and Communications**

<b>Antenna type</b>	High efficiency antenna. One embedded dual band 2.4/5 GHz antenna is provided to the card to support WLAN communications and Bluetooth communications
<b>Form Factor</b>	PCI-Express M.2 MiniCard
<b>Dimensions</b>	Type 2230 : 2.3 x 22.0 x 30.0 mm
<b>Weight</b>	Type 2230 : 2.8g
<b>Operating Voltage</b>	3.3v +/- 9%
<b>Temperature</b>	Operating: 14° to 158° F (–10° to 70° C) Non-operating: –40° to 176° F (–40° to 80° C)
<b>Humidity</b>	Operating: 10% to 90% (non-condensing) Non-operating: 5% to 95% (non-condensing)
<b>Altitude</b>	Operating: 0 to 10,000 ft (3,048 m) Non-operating: 0 to 50,000 ft (15,240 m)
<b>LED Activity</b>	LED Amber – Radio OFF; LED White – Radio ON
<b>HP Integrated Module with Bluetooth 4.0/4.1/4.2 Wireless Technology</b>	
<b>Bluetooth Specification</b>	4.0/4.1/4.2 Compliant
<b>Frequency Band</b>	2402 to 2480 MHz
<b>Number of Available Channels</b>	Legacy : 0~79 (1 MHz/CH) BLE : 0~39 (2 MHz/CH)
<b>Data Rates and Throughput</b>	Legacy : 3 Mbps data rate; throughput up to 2.17 Mbps BLE : 1 Mbps data rate; throughput up to 0.2 Mbps Legacy : Synchronous Connection Oriented links up to 3, 64 kbps, voice channels Legacy : Asynchronous Connection Less links 2178.1 kbps/177.1 kbps asymmetric (3-DH5) or 864 kbps symmetric (3-EV5)
<b>Transmit Power</b>	The Bluetooth component shall operate as a Class II Bluetooth device with a maximum transmit power of + 4 dBm for BR and EDR.
<b>Power Consumption</b>	Peak (Tx) 330 mW Peak (Rx) 230 mW Selective Suspend 17 mW
<b>Electrical Interface</b>	USB 2.0 compliant
<b>Bluetooth Software Supported Link Topology</b>	Microsoft Windows Bluetooth Software
<b>Power Management</b>	Microsoft Windows ACPI, and USB Bus Support
<b>Certifications</b>	FCC (47 CFR) Part 15C, Section 15.247 & 15.249
<b>Power Management Certifications</b>	ETS 300 328, ETS 300 826 Low Voltage Directive IEC950 UL, CSA, and CE Mark
<b>Bluetooth Profiles Supported</b>	BT4.1-ESR 5/6/7 Compliance LE Link Layer Ping LE Dual Mode LE Link Layer LE Low Duty Cycle Directed Advertising LE L2CAP Connection Oriented Channels Train Nudging & Interlaced Scan BT4.2 ESR08 Compliance LE Secure Connection- Basic/Full LE Privacy 1.2 –Link Layer Privacy LE Privacy 1.2 –Extended Scanner Filter Policies

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*Technical Specifications – Networking and Communications*

LE Data Packet Length Extension  
FAX Profile (FAX)  
Basic Imaging Profile (BIP)2  
Headset Profile (HSP)  
Hands Free Profile (HFP)  
Advanced Audio Distribution Profile (A2DP)

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### Technical Specifications - Audio

#### AUDIO

##### High Definition Audio

<b>Type</b>	Integrated
<b>HD Stereo Codec</b>	Conexant CX20632
<b>Audio I/O Ports</b>	Front: 1 - Headset connector supports a CTIA style headset and is re-taskable as a Line-in, Line-out, Microphone-in or Headphone-out port 1 - Headphone port All ports are 3.5mm and support stereo
<b>Internal Speaker Amplifier</b>	2W class D mono amplifier for the internal speaker only. External speakers must be powered
<b>Multi-streaming Capable</b>	Playback multi-streaming allows independent audio streams to be sent to/from the front jacks or integrated speaker.
<b>Sampling</b>	Independent sampling rates for DAC's and ADC's; supports resolutions from 16 to 24-bit; 44.1 kHz to 192 kHz for DAC and 44.1 kHz to 96 kHz for ADC
<b>Wavetable Syntheses</b>	Yes - Uses OS soft wavetable
<b>Analog Audio</b>	Yes
<b># of Channels on Line-Out</b>	Stereo (Left & Right channels)
<b>Internal Speaker</b>	Yes

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### Technical Specifications – Power

## POWER

### UNIT ENVIRONMENT AND OPERATING CONDITIONS

#### General Unit Operating Guidelines

- Keep the computer away from excessive moisture, direct moisture and the extremes of heat and cold, to ensure that unit is operated within the specified operating range.
- Leave a 10.2 cm (4 in) clearance on all vented sides of the computer to permit the required airflow.
- Never restrict airflow into the computer by blocking any vents or air intakes.
- Do not stack computers on top of each other or place computers so near each other that they are subject to each other's re-circulated or preheated air.
- Occasionally clean the air vents on the front, back, and any other vented side of the computer. Lint, dust and other foreign matter can block the vents and limit the airflow.
  - If the computer is to be operated within a separate enclosure, intake and exhaust ventilation must be provided on the enclosure, and the same operating guidelines listed above will still apply.

<b>Temperature Range</b>	Operating: 5°C ~35°C Non-Operating: -40°C ~66°C
<b>Relative Humidity</b>	Operating 5% to 90% relative humidity at max inlet temperature Non Operating 5% to 90% relative humidity at max inlet temperature
<b>Maximum Altitude (unpressurized)</b>	Operating: 5000m Non-operating: 50000ft (15240 m)
<b>Shock</b>	Operating: 40 g, six surfaces Non-operating: 80 g, six surfaces
<b>Vibration</b>	Operating: 2-g peak acceleration Non-operating: 4-g peak acceleration
<b>External Power Supplies</b>	65W EPS, 89% average efficiency at 115V & 230Vac
<b>80 PLUS Platinum</b>	N/A
<b>Operating Voltage Range</b>	90Vac~264Vac
<b>Rated Voltage Range</b>	100Vac~240Vac
<b>Rated Line Frequency</b>	50HZ~60HZ
<b>Operating Line Frequency</b>	47HZ~63HZ
<b>Rated Input Current</b>	≤1.6A
<b>Rated Input Current with Energy Efficient* Power Supply</b>	≤1.6A
<b>DC Output</b>	+19.5V
<b>Current Leakage (NFPA 99: 2102)</b>	Less than 500 microamps of leakage current at 264 Vac with the ground wire disconnected, as required for Non-patient Electrical Appliances and Equipment used in a patient care facility or that contact patients in normal use. Per section 10.3.5.1. Less than 100 microamps of leakage current at 264 Vac with the ground wire intact with normal polarity, as required for Non-patient Electrical Appliances and Equipment used in a patient care facility or that contact patients in normal use. Per section 10.3.5.1.
<b>Power Supply Fan</b>	N/A
<b>Power cord length</b>	6.0 ft. (1.83 m)

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### *Technical Specifications – Power*

**Dimensions** 113.5mm x 55mm x 30mm

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### Summary of Changes

<b>Date of change:</b>	<b>Version History:</b>		<b>Description of change:</b>
August 29, 2018	From v1 to v2	Changed	Integrated Graphics and Power sections
September 25, 2018	From v2 to v3	Removed	Intel Core i5-8600T
October 11, 2018	From v3 to v4	Added	Shock and Vibration information
		Removed	Intel Core i3-8300T & Intel Pentium G5500T
October 29, 2018	From v4 to v5	Changed	OS, Adapters and Storage sections

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