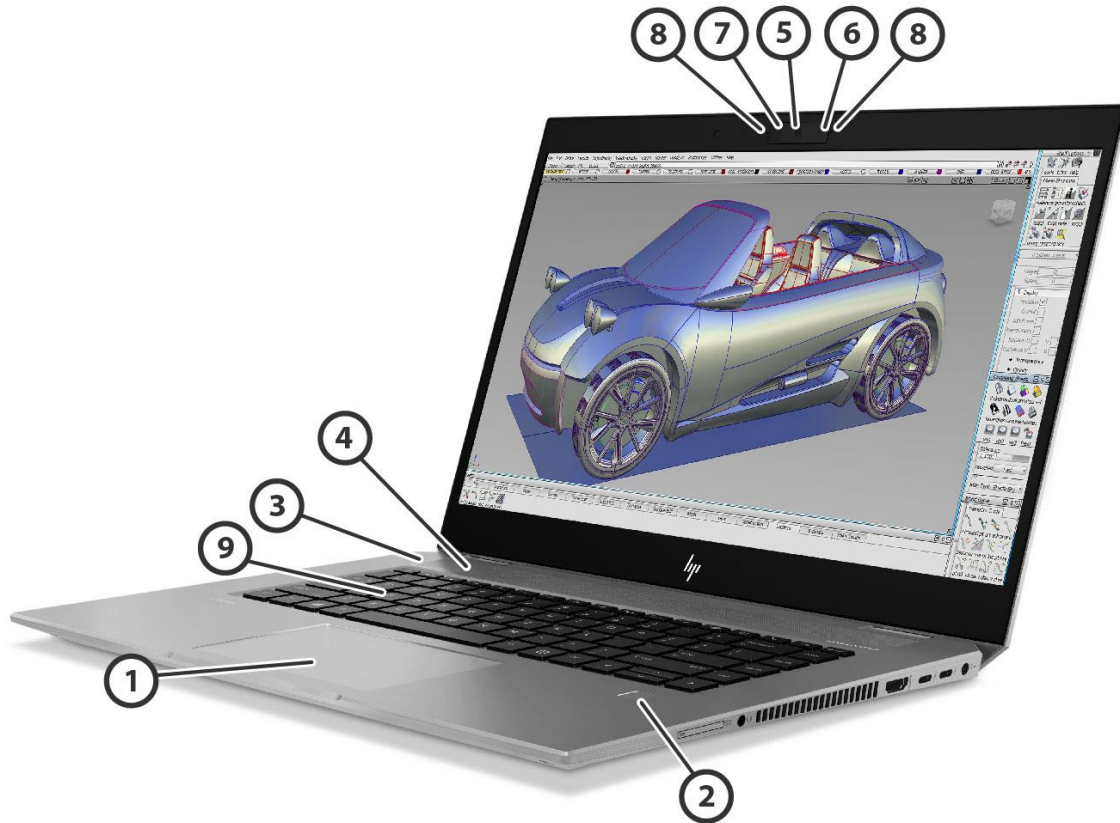


### Overview

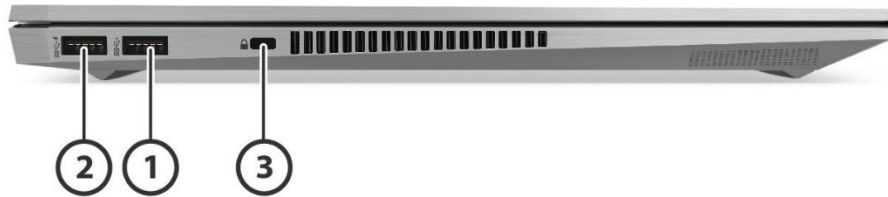
### HP ZBook Studio G5 Mobile Workstation



#### FRONT VIEW

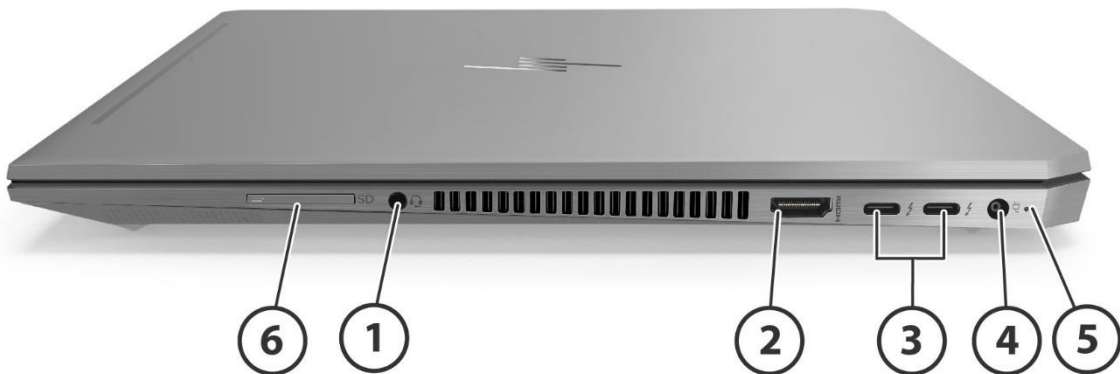
- |    |                    |    |                    |
|----|--------------------|----|--------------------|
| 1. | Clickpad           | 6. | IR Camera          |
| 2. | Fingerprint sensor | 7. | HP Privacy Shutter |
| 3. | Power button       | 8. | Microphone         |
| 4. | Speakers           | 9. | Collaboration Keys |
| 5. | Camera             |    |                    |

### Overview



#### LEFT VIEW

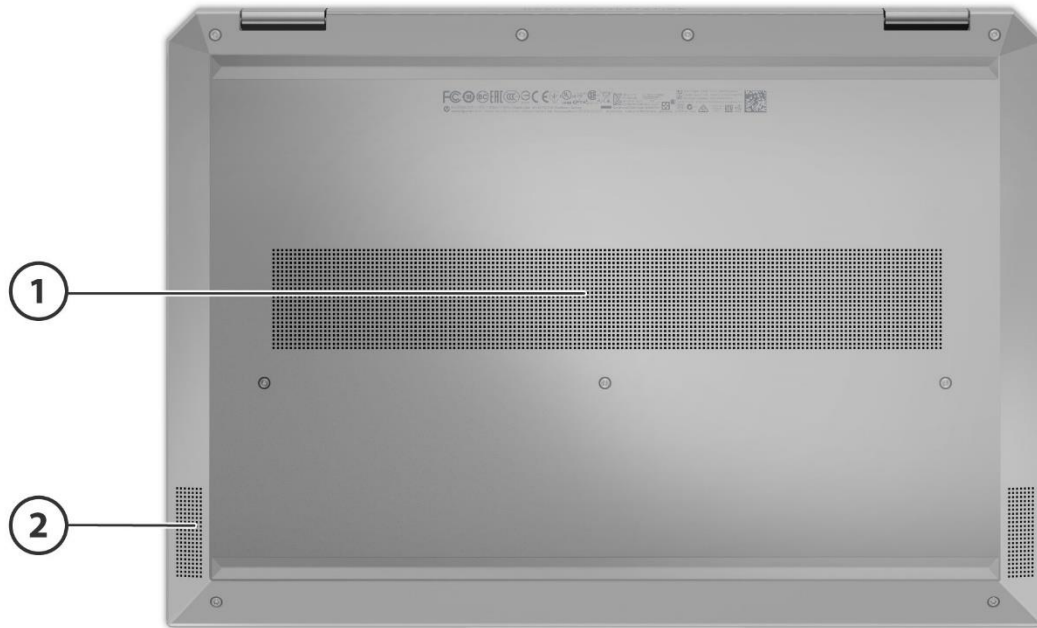
- |            |                          |
|------------|--------------------------|
| 1. USB 3.0 | 2. USB 3.0 charging port |
|            | 3. Security cable slot   |



#### RIGHT VIEW

- |  |                    |
|--|--------------------|
| 1. Stereo microphone in / headphone-out combo jack | 4. Power connector |
| 2. HDMI 2.0  | 5. Power LED       |
| 3. 2Thunderbolt™ 3 ports                           | 6. SD Card Reader  |

### Overview



#### **BOTTOM VIEW**

1. Fan Venting

2. Speakers

### Overview

#### At A Glance

- Thinner, lighter, smaller chassis over prior generation, 15" diagonal and 4.4 pounds. Designed with full sized chicklet, optional backlit keyboard with numeric keyboard. Spill resistant design with drain.
- Tested and passed 14 MIL-STD-810G tests\*.
- Workstation-caliber NVIDIA® Quadro® discrete graphics featuring NVIDIA® Optimus technology:
  - NVIDIA® Quadro® P1000 4GB GDDR5
  - NVIDIA® Quadro® P2000 4GB GDDR5
- Intel Integrated graphics: Intel® UHD Graphics 630 integrated on Core™ i7 and Core™ i9 processors and Intel® UHD Graphics P630 integrated on Xeon® processors.
- ISV certified to provide fast and reliable performance with workstation applications, including manipulation of 3D textures
- Choice of eight-core 9<sup>th</sup> Generation Intel® Core™ i9 processors, six-core Intel® Xeon® processors, 9<sup>th</sup> Generation Intel® Core™ i7 processors, 8<sup>th</sup> Generation Intel® Core™ i9 or Core™ i7 or quad-core 8<sup>th</sup> Generation Core™ i5 processors.
- Intel® Core™ i9 with vPro™, Intel® Core™ i7 with vPro™, Intel® Core™ i5 with vPro™ technology or Intel® Xeon® with vPro™ technology (optional)
- HP Performance Advisor for optimal configuration, stability, compatibility and best performance
- Up to two SODIMMs supporting up to 64 GB DDR4-2667MHz dual-channel non-ECC memory and up to 32 GB DDR4-2667MHz dual-channel ECC memory available with Intel® Xeon® processors
- Featuring HP Collaboration Keyboard with Clickpad to manage most commonly used conferencing functions with a single keystroke
- Innovative HP World-Facing third mic supports HP Noise Cancellation Software.
- Supports multi-display, including up to three (3) displays without a docking solution, with hybrid graphics enabled. Supports up to five (5) displays with HP Thunderbolt™ Dock G2 (sold separately), with hybrid graphics enabled.
- Two (2) Thunderbolt™ 3 ports (supporting DP 1.3, USB 3.1, PCIe Gen 3 devices) on the new USB-C™ connector, for high speed data/video/audio transfer support.
- Audio by Bang and Olufsen optimized for high fidelity audio with immersive surround sound with deep, rich bass and crystal-clear dialog without distortion at high volume, and new discrete amp.
- HP Long life battery solution: 4-cell (64 WHr) or 6-cell (96 WHr) supporting HP Fast Charge: charges 50% of the battery in 45 minutes.
- Widescreen 15.6-inch diagonal LED-backlit display:
  - FHD IPS eDP + PSR anti-glare, 400 nits with ambient light sensor 72% NTSC (1920x1080)
  - HP Sure View FHD IPS eDP + PSR anti-glare 650nits 72% NTSC (1920x1080)
  - UHD IPS eDP + PSR anti-glare, 400 nits with ambient light sensor 72% NTSC (3840x2160)
  - HP DreamColor Technology UHD IPS eDP + PSR anti-glare, 600 nits 100% Adobe RGB (3840x2160)
- Wireless connectivity options:
  - Intel® Dual Band Wireless-AC 9560 802.11 AC/a/b/g/n (2x2) WLAN and Bluetooth® 5.0 combo adaptor (vPro™) or, Intel® Dual Band Wireless-AC 9560 802.11 AC/a/b/g/n (2x2) WLAN and Bluetooth® 5.0 combo adaptor (non-vPro™)
- Three (3) dedicated drive slots, two (2) M.2 slots, and one (1) 2.5" drive supporting up to 6TB of storage
- Enterprise grade security with HP Sure Sense\*\*\*, HP SureStart Gen4, HP Privacy Camera, HP Sure View, HP Sure Run, HP Sure Recover, SmartCard Reader and Fingerprint sensor<sup>2</sup>, plus optional RAID 1\*\* (mirroring) from HP.

\*MIL STD 810G testing is not intended to demonstrate fitness for U.S. Department of Defense contract requirements or for military use. Test results are not a guarantee of future performance under these test conditions. Accidental damage requires an optional HP Accidental Damage Protection Care Pack.

\*\* RAID 1 Configuration requires 2 NVMe PCIe M.2 drives; both drives must be the same capacity and only available on NVMe technology. Available December 2018

\*\*\*HP Sure Sense requires Windows 10. See product specifications for availability.

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

### Features

#### OPERATING SYSTEM

##### Preinstalled

Windows 10 Pro 64 – HP recommends Windows 10 Pro\*  
Windows 10 Pro for Workstations 64\*  
Windows 10 Home 64 \*

FreeDOS 2.0

##### Supported

Windows 10 Enterprise 64\*  
RedHat® Enterprise Linux® (REHL) 7  
Ubuntu Linux 16.04  
For additional Linux OS information, please reference our Linux Hardware Matrix:  
<http://h10032.www1.hp.com/ctg/Manual/c00060684.pdf>

\*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>

#### PROCESSOR\*

9th Generation Intel® Core™ i7 9750H with Intel® UHD Graphics 630 (2.6 GHz base frequency, up to 4.5 GHz with Intel® Turbo Boost Technology, 12 MB cache, 6 cores)

9th Generation Intel® Core™ i7 9850H with Intel® UHD Graphics 630 (2.6 GHz base frequency, up to 4.6 GHz with Intel® Turbo Boost Technology, 12 MB cache, 6 cores)

9th Generation Intel® Core™ i9 9880H vPro™ with Intel® UHD Graphics 630 (2.3 GHz base frequency, up to 4.8 GHz with Intel® Turbo Boost Technology, 16 MB cache, 8 cores)

9th Generation Intel® Core™ i9 9980HK with Intel® UHD Graphics 630 (2.4 GHz base frequency, up to 5.0 GHz with Intel® Turbo Boost Technology, 16 MB cache, 8 cores)

8th Generation Intel® Core™ i5 8300H with Intel® UHD Graphics 630 (2.3 GHz ( up to 4.0 GHz )/2667 MHz/ 8 MB L3 cache/45W )

8th Generation Intel® Core™ i5 8400H vPro™ processor with Intel® UHD Graphics 630 (2.5 GHz ( up to 4.2 GHz )/2667 MHz/ 8 MB L3 cache/45W )

8th Generation Intel® Core™ i7 8750H with Intel® UHD Graphics 630 (2.2 GHz ( up to 4.1 GHz )/2667 MHz/ 9 MB L3 cache/45W )

8th Generation Intel® Core™ i7 8850H vPro™ processor with Intel® UHD Graphics 630 (2.6 GHz ( up to 4.3 GHz )/2667 MHz/ 9 MB L3 cache/45W )

8th Generation Intel® Core™ i9 8950HK processor with Intel® UHD Graphics 630 (2.9 GHz base frequency, up to 4.8 GHz with Intel® Turbo Boost Technology, 12 MB cache, 6 cores)

Intel® Xeon® E-2176M vPro™ processor with Intel® UHD Graphics P630 (2.7 GHz ( up to 4.4 GHz )/2667 MHz/12 MB L3 cache/45W )

Intel® Xeon® E-2186M vPro™ processor with Intel® UHD Graphics P630 (2.9 GHz ( up to 4.8 GHz )/2667 MHz/12 MB L3 cache/45W )

\* Multicore 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.

\*\*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.

\*\*\*Some functionality of Intel® Core™ i5 with vPro™/Core™ i7 with vPro™/Core™ i9 with vPro™/Xeon® with vPro™ technology, such as Intel® Active Management technology and Intel® Virtualization technology, requires additional third- party software in order to run. Availability of future "virtual appliances" applications for Intel® Core™ i5 with vPro™/Core i7 with vPro™/ Core™ i9

### Features

with vPro™/XEON® with vPro™ technology is dependent on third- party software providers. Compatibility with future "virtual appliances" is yet to be determined.

**NOTE:** 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>

---

### CHIPSET

Mobile Intel® CM246

---

### INTEL® CORE™ I5 WITH VPRO/CORE I7 WITH VPRO/XEON® WITH VPRO TECHNOLOGY CAPABLE

Intel® Core™ i5 with vPro™, Core™ i7 with vPro™ and XEON® with vPro™ technology is a selectable feature that is available on units configured with select processors, a qualified Intel® WLAN module and a preinstalled Windows® operating system. It provides advances in remote manageability, security, energy efficient performance, and wireless connectivity. Intel® Active Management Technology (iAMT) offers built-in manageability and proactive security for networked mobile workstations, even when they are powered off\* or when the operating system is inoperable. It can help identify threats before they reach the network, isolate infected systems, and update regardless of their power state.

\* Requires a Windows operating system, network hardware and software, connection with a power source, and a direct (non-VPN) corporate network connection which is either cable or wireless LAN.

**NOTE:** Some functionality of Intel® Core™ i5 with vPro™/Core™ i7 with vPro™/Xeon® with vPro™ technology, such as Intel® Active Management technology and Intel® Virtualization technology, requires additional third- party software in order to run. Availability of future "virtual appliances" applications for Intel® Core™ i5 with vPro™/Core i7 with vPro™/XEON® with vPro™ technology is dependent on third- party software providers. Compatibility with future "virtual appliances" is yet to be determined.

---

### Features

#### GRAPHICS

##### Integrated

Intel® UHD graphics 630<sup>1,2</sup>  
Intel® UHD graphics P630<sup>1,2</sup>

##### Discrete<sup>3,4</sup>

NVIDIA® Quadro® P1000 with 4 GB dedicated GDDR5 video memory  
Microsoft DirectX 12 (Shader Model 5.0) and OpenGL 4.4 capable

NVIDIA® Quadro® P2000 with 4 GB dedicated GDDR5 video memory  
Microsoft DirectX 12 (Shader Model 5.0) and OpenGL 4.4 capable

**NOTE 1:** UHD content required to view UHD images

**NOTE 2:** Intel® UHD graphics 630 is configurable as a standalone graphics option; Intel® UHD graphics P630 only used when NVIDIA® Optimus™ Technology is enabled.

**NOTE 3:** NVIDIA® Quadro® mobile professional graphics support up to four independent displays when using a HP ZBook Dock with Thunderbolt™ 3 (sold separately) or DP 1.2 hubs with MST.

**NOTE 4:** Must be configured with the 6-cell 96 WHr battery; cannot be configured with a Hard Disk Drive.

**NOTE:** Intel® UHD Graphics 630 integrated on Core™ i9, Core™ i7 and Core™ i5 processors. Intel® UHD Graphics P630 integrated on Xeon® processors.

##### DisplayPort™ 1.3 protocol features supported on Thunderbolt™ 3 ports:

- Legacy displays (HDMI, DVI, VGA) may be attached to Thunderbolt™ port with the use of a certified dongle.
- DisplayPort™ monitors capable of supporting DP 1.3 may be directly attached to the Thunderbolt™ port to achieve HBR2 with the use a dongle.
- Thunderbolt™ 3 enabled monitors may be directly attached to the Thunderbolt™ port to achieve HBR2 and MST.
- DisplayPort™ 1.3 MST feature ("daisy-chain" feature) is supported through Thunderbolt™ 3 port on Thunderbolt™ 3 enabled devices or DisplayPort™ 1.3 monitors (requires monitor with DisplayPort™ 1.3 MST capability) with the use of a dongle.
- Up to 2 streams (eight lanes) of DisplayPort™ 1.3 are supported over a single Thunderbolt™ 3 port. Up to (2) 4K displays 24/30-bit color depth at 60 Hz or (1) 5K display supported over a single Thunderbolt™ 3 port. (Requires Intel® certified Thunderbolt™ cable).
- DisplayPort™ 1.3 w/MST (Multi-stream Transport): Supports resolutions up to Full 4K, 24/30-bit color depth at 60 Hz, and WUXGA (1920 x1200) monitors, 24/30-bit color depth at 120 Hz.

\*Thunderbolt™ 3 is superset port supporting DisplayPort™ 1.3, USB 3.1 Gen 2, and PCIe Gen 3 devices over the new USB-C™ connector. Install all the latest drivers for your Thunderbolt™ device before connecting the device to the Thunderbolt™ port. Thunderbolt™ cable and Thunderbolt™ device (sold separately) must be compatible with Windows. To determine whether your device is Thunderbolt™ Certified for Windows, see <https://Thunderbolttechnology.net/products>.

##### Multi-Display Support

###### Without HP Thunderbolt Dock G2:

HP ZBook Studio with hybrid graphics and without the use of the ZBook dock supports up to a maximum of three independent displays. These three displays are the internal panel plus two external displays connected two of the three following ports: HDMI 2.0, Thunderbolt™ 3, Thunderbolt™ 3. HP ZBook Studio configuration with Intel® integrated graphics and without the use of the ZBook dock supports up to a maximum of three independent displays. Any three display combination of the system panel plus 2 of the following HDMI, Thunderbolt™ 3, Thunderbolt™ 3.

### Features

#### With HP Thunderbolt Dock G2:

The HP Thunderbolt Dock G2 has Thunderbolt™ 3 port, VGA, two DisplayPort™ 1.3, and a USB-C port. When used together with the HP ZBook Studio configuration with hybrid graphics, a maximum of five independent displays are supported. These five displays are internal panel, one external display connected to the system's HDMI port and four external displays connected to the ZBook dock's Thunderbolt™ 3, VGA, and two DisplayPort™ ports. When used together with the HP ZBook Studio configuration with Intel® integrated graphics, a maximum of three independent displays are supported. Any three display combination of the system panel, system ports and ZBook Dock ports.

---

## DISPLAY

### Internal

- 15.6" diagonal FHD IPS eDP + PSR anti-glare LED-backlit, 400 nits with ambient light sensor 72% NTSC (1920x1080)
- 15.6" diagonal UHD IPS eDP + PSR anti-glare LED-backlit, 400 nits with ambient light sensor 72% NTSC (3840x2160)
- HP DreamColor Display, 15.6" diagonal UHD IPS eDP + PSR anti-glare, RG phosphors - LED-backlit, 600 nits, 100% AdobeRGB with 10-bit color (3840x2160)
- HP Sure View Display 15.6" diagonal FHD IPS eDP+PSR LED-backlit, 650 nits 72% NTSC (1920x1080)

**NOTE:** Resolutions are dependent upon monitor capability, and resolution and color depth settings.

---



### Features

#### STORAGE AND DRIVES\*

Three (3) dedicated drive slots, two (2) M.2 slots, and one (1) 2.5" drive bays supporting up to 6TB of storage

##### Choose up to 2 M.2 drives:

###### SATA SED Solid State Drives\*

256 GB SATA Self Encrypting Drive (SED)

###### NVMe Solid State Drives

16 GB Intel® Optane™ memory\*\*, \*\*\*

256GB PCIe (NVMe) TLC Solid State Drive

512GB PCIe (NVMe) TLC Solid State Drive

1 TB PCIe (NVMe) TLC Solid State Drive

2 TB PCIe (NVMe) TLC Solid State Drive

256GB PCIe (NVMe) TLC Self Encrypting Drive (SED) Solid State Drive

512GB PCIe (NVMe) TLC Self Encrypting Drive (SED) Solid State Drive

###### NVMe RAID 1\*\*\*\* (optional)

(2) 1 TB PCIe (NVMe) TLC Solid State Drive

(2) 2 TB PCIe (NVMe) TLC Solid State Drive

##### Choose up to 1 2.5" Storage Bay Drives\*.\*.\*.\*

2 TB 5400 rpm SATA Hard Disk Drive

500 GB SATA SSHD (Hybrid Drive) (8 GB cache)

1 TB SATA SSHD (Hybrid Drive) (8 GB cache)

2 TB SATA SSHD (Hybrid Drive) (8 GB cache)

500 GB 7200 rpm SATA Hard Disk Drive

1 TB 7200 rpm SATA Hard Disk Drive

500 GB 7200 rpm SATA SED (Self Encrypting Drive) Hard Disk Drive

500 GB 5400 rpm SATA FIPS 140-2 SED Hard Disk Drive

256GB SATA Solid State Drive

1 TB SATA Solid State Drive

###### HP 3D DriveGuard (Windows only)

The hard drive is mounted directly to the notebook frame, reducing the transmission of shock to the hard drive. Uses three-axis digital motion detection with intelligent sensitivity to help protect the hard drive during normal use from shock and vibration. The digital accelerometer temporarily halts all data transfer and parks the hard drive when abrupt motion is detected.

\*For storage drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 30 GB (for Windows 10) is reserved for system recovery software.

\*\*Must be configured with either a Hard Disk Drive or a Hybrid Drive. Cannot be configured with an additional M.2 SSD.

\*\*\*Intel® Optane™ memory system acceleration does not replace or increase the DRAM in your system.

\*\*\*\* Must be configured with the 4-cell 64Whr battery and no discrete graphics

\*\*\*\*\* RAID 1 Configuration requires 2 NVMe PCIe M.2 drives; both drives must be the same capacity and only available on NVMe technology. Available December 2018

#### DRIVE CONTROLLERS

2.5" Storage Bays and M.2 2280 (SATA):

SATA-3 or SATA-2 for HDD and SATA-3 for SSD

NVMe M.2 2280 SSD:

PCIe Gen 3 x4

RAID 1

PCIe Gen3 x 4\*

### Features

Supported RAID 0, 1:

SATA M.2 only

**NOTE:** RAID 1 configuration from HP must be like for like capacity and only available on NVMe technology.

---

### MEMORY

#### Standard

32 GB DDR4 ECC or 64 GB DDR4 Non-ECC SDRAM (With transfer rates up to 2667MT/s<sup>1</sup>)

Two SODIMM slots supporting dual-channel memory

4 GB, 8GB, 16, 32 GB SODIMMs (for Intel® Core™ and Xeon® Processors)

8GB and 16 GB ECC SODIMMs (for Intel® XEON® Processors)

#### Maximum

Upgradeable to 64 GB with optional 32 GB SODIMMs in 2 slots

#### Dual-channel

Maximized dual-channel performance requires SODIMMs of the same size and speed in both memory channels.

**NOTE 1:** Only 2 DIMM configurations run at 2667 MHz.

**NOTE:** Maximum memory capacities assume Windows 64-bit operating systems. With Windows 32-bit operating systems, memory above 3 GB may not all be available due to system resource requirements.

---

### Features

## NETWORKING/COMMUNICATIONS

### Wireless

Support for a broad range of secure, integrated wireless LAN options featuring support for the latest industry standards. Integrated Bluetooth® is also available (factory configurable only) and can be combined with any of the supported wireless LAN options.

### 802.11 Wireless LAN options\*\*

Intel® Dual Band Wireless-AC 9560 802.11ac (2x2) Wi-Fi® and Bluetooth® 5.0 Combo;  
Intel® Dual Band Wireless-AC 9560 802.11ac (2x2) Wi-Fi® and Bluetooth® 5.0 Combo, non-vPro™

### Near Field Communication<sup>1</sup>

NFC Mirage WNC XRAV-1 (NXP NPC300 I2C 10mmx17mm)

\*\*Wireless cards are optional or add-on features and requires separately purchased wireless access point and internet service. Availability of public wireless access points limited. 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.

<sup>1</sup>Sold separately or as an optional feature.

---

## AUDIO/MULTIMEDIA

### Audio<sup>1</sup>

Audio Bang & Olufsen, dual stereo speakers

Dual array digital microphone

Optional HP World Facing microphone

Functions keys for volume up and down

Combo microphone/headphone jack

HD audio; featuring HP Noise Cancellation Software, HP Clear Sound Amp and Skype for Business® Certification

### Webcam<sup>\*,\*\*</sup>

Optional HP Privacy Camera (720p HD webcam)

Optional HP Privacy Camera (720p HD webcam) IR camera for face authentication with Windows Hello

- Privacy Camera features sliding camera shutter (non-touch only)
- HD format (widescreen)
- Supports videoconferencing and still image capture
- High quality fixed focus lens
- Video capture at various resolutions up to 1280x720 resolution (720p) and up to 30fps
- M-JPEG compression supports higher frame rates for video capture and videoconferencing
- Improved low light sensitivity
- Improved dynamic range

\* HD content required to view HD images.

\*\*Optional or add-on feature.

**Note 1:** Dual-microphone array when equipped with optional webcam and optional world facing microphone

---

### Features

#### **KEYBOARDS/POINTING DEVICES/BUTTONS & FUNCTION KEYS**

##### **Keyboard**

HP Collaboration Keyboard to manage the most common collaboration function with a keystroke. Backlit keyboard with Function key control to toggle backlit brightness setting - off/full/half brightness. The HP spill-resistant keyboard is designed using a thin layer of Mylar film under the keyboard and a drain system that funnels fluid through a hole in the bottom of the notebook. This minimizes the risk of damage to sensitive components underneath. The 100-key compatible keyboard features a full-pitch key layout with desktop keyboard features, such as editing keys, both left and right control and alt keys, function keys, and 18.7 x 18.4 mm key pitch (center-to-center spacing). U.S. and International key layouts are available. Other features include hot keys for instant access to power conservation and brightness.

##### **Pointing Devices**

Clickpad with multi-touch gestures enabled, taps enabled as default

Microsoft Precision Touchpad Default Gestures Support

##### **Buttons and Function Keys**

Discrete buttons provide easy access to the following features:

- F1 – Display Switching
  - F2 – HP SureView (if configured)
  - F3 - Brightness Down
  - F4 – Brightness Up
  - F5 – Audio mute
  - F6 – Volume down
  - F7 – Volume up
  - F8 – Microphone mute
  - F9 – Keyboard backlight
  - F10 – NumLock
  - F11 – Wireless on/off
  - F12 – Calendar
  - F13 – Share screen
  - F14 – Call
  - F15 – End Call
-

### Features

## SOFTWARE AND SECURITY

### Workstation ISV Certifications

See the latest list of certifications at: <http://www.hp.com/go/isv>

### HP Remote Graphics Software

The remote desktop solution for serious workstation users and their most demanding applications.

Download at: <http://www.hp.com/go/RGS>

### HP Performance Advisor

HP Performance Advisor enables optimal configuration of HP Mobile Workstations delivering stability and best performance. HP Performance Advisor will guide your system setup allowing a "custom" configuration that best matches the workstation to user requirements.

Download at: <http://www.hp.com/go/performanceadvisor>

### Standard Security Features

HP BIOSphere Gen4<sup>1</sup>

HP DriveLock & Automatic DriveLock

BIOS Update via Network

HP BIOS Config Utility (BCU)<sup>9</sup>

Secure Erase<sup>3</sup>

Absolute persistence module<sup>7</sup>

Pre-boot Authentication

Power-on authentication

SATA 0,1 port disablement (viaBIOS)

RAID configurations

Serial, USB enable/disable (viaBIOS)

Power-on password (viaBIOS)

Setup password (viaBIOS)

Support for chassis padlocks and cable lock devices

HP Sure Click<sup>4</sup>

One-Step Logon

Security lock slot

Support for Intel® AT

TPM 2.0 Embedded Security Chip shipped with Windows 10 (Common Criteria EAL4+ Certified)

Measured Boot

HP Sure Click

HP Sure Start G4<sup>2</sup>

HP Sure Run<sup>5</sup>

HP Sure Recover<sup>6</sup>

HP Sure Sense<sup>13</sup>

Device Access Manager

HP Security Manager (including Credential Manager and Password Manager<sup>12</sup>)

Windows Defender<sup>8</sup>

HP Host Based Mac Address

HP Client Catalog<sup>9</sup>

HP Driver Packs<sup>9</sup>

HP System Software Manager (SSM)<sup>9</sup>

HP Manageability Integration Kit for Microsoft SCCM<sup>10</sup>

### TPM

Model: Infineon SLB9670

Version: 7.63.3353.0

Revision: TPM 2.0

### Features

FIPS 140-2 Compliant: Yes with Convert TPM to 2.0 (FIPS 140-2) option

#### **Fingerprint Sensor (Optional)**

Voltage: 3.0-3.6V

Operating temperature: -20° - 85°C

Imaging current: 31mA

Wake on finger current: 40 uA

Capture rate: 30ms/frame

ESD Resistance: IEC 6100-4-2 4B (+/-15KV)

Detection Matrix: 363 dpi, sensing area 8x8 mm

#### **Optional Security Features**

HP Fingerprint Sensor (optional)<sup>11</sup>

IR Camera with Windows Hello

Absolute Data Protect\* with GPS Tracking - Subscription based security solution providing the ability to track, initiate physical recovery, conduct asset management, and perform remote data delete by utilizing GPS technology. GPS functionality requires HP Mobile Broadband Module.

\* The Absolute Data Protect agent is shipped turned off and must be activated by customers when they purchase a subscription. Subscriptions can be purchased for terms ranging multiple years. Service is limited, check with Absolute for availability outside the U.S.

1. HP BIOSphere Gen4 requires Intel® or AMD 8th generation processors.
2. HP Sure Start Gen4 is available on HP Z Workstations products equipped with 8th generation Intel® or AMD processors.
3. For the methods outlined in the National Institute of Standards and Technology Special Publication 800-88 "Clear" sanitation method.
4. HP Sure Click is available on most HP PCs and supports Microsoft® Internet Explorer and Chromium™. Supported attachments include Microsoft Office (Word, Excel, PowerPoint) and PDF files in read only mode, when Microsoft Office or Adobe Acrobat are installed.
5. HP Sure Run is available on HP Elite products equipped with Intel® or AMD® 8th generation processors
6. HP Sure Recover is available on HP Elite PCs with 8th generation Intel® or AMD processors and requires an open, wired network connection. You must back up important files, data, photos, videos, etc. before using HP Sure Recover to avoid loss of data
7. BIOS Absolute Persistence module is shipped turned off, and will be activated when customers purchase and activate a subscription. Service may be limited. Check with Absolute for availability outside the U.S. The optional subscription service of Absolute Recovery Guarantee is a limited warranty. Certain conditions apply. For full details visit: <http://www.absolute.com/company/legal/agreements/computrace-agreement>. If Data Delete is utilized, the Recovery Guarantee payment is null and void. In order to use the Data Delete service, customers must first sign a Pre-Authorization Agreement and either create a PIN or purchase one or more RSA SecurID tokens from Absolute Software.
8. Windows Defender Opt In, Windows 10, and internet connection required for updates.
9. Not preinstalled, however available for download at <http://www.hp.com/go/clientmanagement>
10. HP Manageability Integration Kit can be downloaded from <http://www8.hp.com/us/en/ads/clientmanagement/overview.html>
11. Finger Sensor is optional
12. HP Password manager requires Windows.
13. HP Sure Sense requires Windows 10. See product specifications for availability.

### Features

#### **HP CENTRAL MANAGEMENT**

HP offers a variety of scalable hardware, software, and BIOS-based security features to help you defend your organization against viruses and other threats. These integrated security features safeguard what matters to you the most - your data, device and identity. Now, be confident your fleet of devices is protected in multiple layers of HP Client Security protection.

HP BIOS Protection keeps you up and running with enhanced protection against virus attacks and other threats. And if the BIOS is accidentally compromised, the auto recovery feature automatically restores it to its fully functional state.

HP Sure Start detects and negates a BIOS attack with automatic recovery of the BIOS even when the installation is accidentally compromised (i.e. power outage). When HP Sure Start heals the BIOS an event log is generated that an IT administrator can retrieve so the business is aware of a BIOS attack. Golden copy of BIOS is stored in protected nonvolatile memory providing redundant, hardware-based protection against a new generation of attacks. This helps to future-proof your technology and business.

An optional fingerprint sensor helps keep your identity secure. The security cable slot helps keep your notebook physically secure.

You can even permanently destroy data on your hard drive in preparation for your system disposal or redeployment with Secure Erase.

---

### Features

#### POWER

##### Power Supply

HP 150W Slim Smart AC adapter  
(153 x 66 x 22 mm)

##### Primary Battery

HP Long Life 4-cell Polymer Battery (64 WHr) \*

HP Long Life 6-cell Polymer Battery (96 WHr) \*

**NOTE:** Battery is internal and not replaceable by the customer

**NOTE:** HP Long Life 4-cell 64Whr battery can be configured with a hard disk drive and cannot be configured with discrete graphics. HP Long Life 6-cell 96 WHr battery cannot be configured with a hard disk drive and is required in discrete graphics configurations.

##### Battery Life

Battery life up to 18.5 hours for UMA graphics only configuration \*\*

Battery life up to 16.5 hours for Hybrid graphics configuration \*\*

##### System Standby Time

Up to 1.4 weeks\*\*\*

\* Available with 3-year limited warranty only

\*\* Battery life will vary depending on the product model, configuration, loaded applications, features, use, wireless functionality and power management settings. The maximum capacity of the battery will naturally decrease with time and usage. See MobileMark14 battery benchmark <https://bapco.com/products/mobilemark-2014/> for additional details.

\*\*\* Standby life will vary depending on various factors including battery, Memory, CPU, EC and LAN chip. The maximum capacity of the battery will naturally decrease with time and usage.

##### Power Conservation

NVIDIA® Optimus or AMD Enduro™ technology

Hibernation

Standby

ACPI compliance

---

#### ENVIRONMENTAL

US ENERGY STAR®

IT ECO declaration

EPEAT® registered\*

Low Halogen\*\*

\* EPEAT® registered where applicable. EPEAT registration varies by country. See [www.epeat.net](http://www.epeat.net) for registration status by country. See HP's 3rd party option store for solar energy accessory [www.hp.com/go/options](http://www.hp.com/go/options).

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



### Features

---

#### WEIGHTS & DIMENSIONS

**Weight**

Starting at 4.4 lb. (2.0kg.)

**Dimensions** (w x d x h)

14.17 in x 9.65 in x 0.35 in (front) – 0.69 in (rear)

360 mm x 254 mm x 8.8 mm (front) – 17.4 mm (rear)

**Note:** Height varies depending upon where on the notebook the measurement is made. Weight varies by configuration and components. Weight includes Quad Core CPU, UHD, 4-cell battery, Intel® UHD graphics, no FPR, 8GB x 1 SODIMM, WLAN, M.2 SSD, no camera, no WWAN, no BT

---

#### PORTS/SLOTS

**Ports****Left side:**

- (1) USB 3.0 Charging Port
- (1) USB 3.0
- (1) Security lock slot

**Right side:**

- (1) HDMI 2.0
- (2) Thunderbolt™ 3\* (Supporting DisplayPort™ 1.3, USB 3.1 Gen2, PCIe Gen 3 devices)
- (1) Stereo microphone in / headphone-out combo jack
- (1) Power Connector
- (1) Full-size SD Card Reader

**Thunderbolt™ 3**

Thunderbolt™3 ports supports DisplayPort™ 1.3, USB 3.1 Gen 2, and PCIe Gen 3 devices over the new USB-C port connector. The port is compatible with existing DisplayPort™ displays, devices, and cables. Install all the latest drivers for your Thunderbolt™ device before connecting the device to the Thunderbolt™ port. Thunderbolt™ cable and Thunderbolt™ device (sold separately) must be compatible with Windows®. To determine whether your device is Thunderbolt™ Certified for Windows, see <https://thunderbolttechnology.net/products>.

**Digital Media Slots**

- (1) SD UHS-II Flash Media slot (Supports next generation SD (Secure Digital), backward compatible to SDHC, SDXC)
- 

#### SERVICE AND SUPPORT

Limited 3-year or 1-year limited warranty options available, depending on country. Batteries have a default one year limited warranty except for Long Life batteries which will have same 1-year or 3-year limited warranty as the platform. Optional\* HP Care Pack Services are extended service contracts which go beyond your standard limited warranties. To choose the right level of service for your HP product, use the HP Care Pack Services Lookup Tool at <http://www.hp.com/go/cpc>.

\*Sold separately or as an optional feature. 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. 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. Consult your local HP Customer Support Center for details.

## Features

---

### System Technical Specifications

#### SYSTEM UNIT

<b>Stand-Alone Power Requirements (AC Power)</b>	<b>Nominal Operating Voltage</b>	19.5 V	
	<b>Average Operating Power</b>	DreamColor Without DreamColor	25 W (Windows® 10 64-bit) 16.8 W (Windows® 10 64-bit)
	<b>Max Operating Power</b>	< 200 W	
<b>Temperature</b>	<b>Operating</b>	32° to 95° F (0° to 35° C)	
	<b>Non-operating</b>	-4° to 140° F (-20° to 60° C)	
<b>Relative Humidity</b>	<b>Operating</b>	10% to 90%, non-condensing	
	<b>Non-operating</b>	5% to 95%, 101.6° F (38.7° C) maximum wet bulb temperature	
<b>Shock</b>	<b>Operating</b>	40 G, 2 ms, half-sine	
	<b>Non-operating</b>	200 G, 2 ms, half-sine	
<b>Random Vibration</b>	<b>Operating</b>	0.75 grms	
	<b>Non-operating</b>	1.50 grms	
<b>Altitude (unpressurized)</b>	<b>Operating</b>	-50 to 10,000 ft (-15.24 to 3,048 m)	
	<b>Non-operating</b>	-50 to 40,000 ft (-15.24 to 12,192 m)	
<b>Industry Standard Certifications</b>	<b>UL</b>	Yes	
	<b>CSA</b>	Yes	
	<b>FCC Compliance</b>	Yes	
	<b>ENERGY STAR®</b>	Select models*	
	<b>EPEAT®</b>	Gold **	
	<b>ICES</b>	Complete	
	<b>Australia / NZ A-Tick Compliance</b>	Complete	
	<b>CCC</b>	Complete	
	<b>Japan VCCI Compliance</b>	Complete	
	<b>KC</b>	Complete	
	<b>BSMI</b>	Complete	
	<b>CE Marking Compliance</b>	Complete	
<b>MIL STD 810G</b>	Complete ***		

\* Configurations of the HP ZBook Studio that are ENERGY STAR® qualified are identified as HP ZBook Studio G5 ENERGY STAR® on HP websites and on <http://www.energystar.gov>.

\*\* EPEAT® registered where applicable. EPEAT registration varies by country. See <http://www.epeat.net> for registration status by country. See HP's 3rd party option store for solar energy accessory [www.hp.com/go/options](http://www.hp.com/go/options).

\*\*\* MIL STD 810G testing is pending and is not intended to demonstrate fitness for U.S. Department of Defense contract requirements or for military use. Test results are not a guarantee of future performance under these test conditions. Accidental damage requires an optional HP Accidental Damage Protection Care Pack.

For accessibility information on HP products, please visit: <http://www.hp.com/accessibility>.

### Technical Specifications – Displays

#### DISPLAYS

**15.6" diagonal FHD AG LED IPS, with Ambient light sensor 72% NTSC (1920x1080) (400 nits)**

<b>Active Area (W x H)</b>	344.16 x 193.59	
<b>Dimensions (W x H)</b>	350.96 x 216.75	
<b>Weight</b>	370 g (max)	
<b>Surface Treatment</b>	Anti-glare	
<b>Contrast Ratio</b>	600:1 (typical)	
<b>Refresh Rate</b>	60 Hz	
<b>Brightness*</b>	400 nits typical	
<b>Pixel Resolution</b>	<b>Format</b>	1920 x 1080 (FHD)
	<b>Configuration</b>	RGB Stripe
<b>Backlight</b>	LED	
<b>PPI</b>	141	
<b>Viewing Angle</b>	85/85/85/85 (Left/Right/Down/Up) (typical)	

\* All specifications represent the typical specifications provided by HP's component manufacturers; actual performance may vary either higher or lower.

**HP Sure View Privacy Display 15.6" diagonal FHD AG LED IPS 72% NTSC (1920x1080) (650 nits)**

<b>Active Area (W x H)</b>	344.16 x 193.59	
<b>Dimensions (W x H)</b>	350.96 x 216.75	
<b>Diagonal Size</b>	15.6 in (39.6 cm)	
<b>Weight</b>	320 g (max)	
<b>Surface Treatment</b>	Anti-glare	
<b>Contrast Ratio</b>	600:1 (typical)	
<b>Refresh Rate</b>	120 Hz	
<b>Brightness*</b>	650 nits typical	
<b>Pixel Resolution</b>	<b>Pitch</b>	0.1793 x 0.1793 mm
	<b>Format</b>	1920 X 1080 (FHD)
	<b>Configuration</b>	RGB Stripe
<b>Backlight</b>	LED	
<b>PPI</b>	141	
<b>Viewing Angle</b>	85/85/85/85 (Left/Right/Down/Up) (typical)	

\* All specifications represent the typical specifications provided by HP's component manufacturers; actual performance may vary either higher or lower.

**HP DreamColor Display 15.6" diagonal UHD IPS AG - 10 (8+2) bit color(3840x2160) (600 nits) 100% AdobeRGB**

<b>Active Area (W x H)</b>	344.2176 x 193.62	
<b>Dimensions (W x H)</b>	350.96 x 217.45	
<b>Diagonal Size</b>	15.6 in (39.6 cm)	
<b>Weight</b>	380 g (max)	
<b>Surface Treatment</b>	Anti-glare	
<b>Contrast Ratio</b>	1200:1 (typical)	
<b>Refresh Rate</b>	60 Hz	

### Technical Specifications – Displays

<b>Brightness*</b>	600 nits typical
<b>Pixel Resolution</b>	<b>Format</b> 3840 x 2160 (UHD)
	<b>Configuration</b> RGB Stripe
<b>Backlight</b>	LED
<b>PPI</b>	282
<b>Viewing Angle</b>	85/85/85/85 (Left/Right/Down/Up) (typical)

\* All specifications represent the typical specifications provided by HP's component manufacturers; actual performance may vary either higher or lower.

#### 15.6" diagonal UHD IPS AG LED with Ambient light sensor 72% NTSC (3840x2160) (400 nits)

<b>Active Area (W x H)</b>	344.2176 x 193.62
<b>Dimensions (W x H)</b>	350.96 x 216.95
<b>Diagonal Size</b>	15.6 in (39.6 cm)
<b>Weight</b>	320 g (max)
<b>Surface Treatment</b>	Anti-glare
<b>Contrast Ratio</b>	1200:1 (typical)
<b>Refresh Rate</b>	60 Hz
<b>Brightness*</b>	400 nits typical
<b>Pixel Resolution</b>	<b>Format</b> 3840 x 2160 (UHD)
	<b>Configuration</b> RGB Stripe
<b>Backlight</b>	LED
<b>PPI</b>	282
<b>Viewing Angle</b>	85/85/85/85 (Left/Right/Down/Up) (typical)

\* All specifications represent the typical specifications provided by HP's component manufacturers; actual performance may vary either higher or lower.

### Technical Specifications – Storage and Drives

#### STORAGE AND DRIVES

##### Internal Storage

<b>Intel® Optane™ Memory (SSD 16 GB 2280 PCI3-3x2 NVMe 3D Xpoint)</b>	<b>Form Factor</b>	M.2 2280
	<b>Capacity</b>	16 GB
	<b>NAND Type</b>	3D Xpoint
	<b>Height</b>	0.09 in (2.3 mm)
	<b>Width</b>	0.87 in (22 mm)
	<b>Interface</b>	PCIe NVMe Gen3X2
	<b>Maximum Sequential Read</b>	900 MB/s
	<b>Maximum Sequential Write</b>	145 MB/s
	<b>Logical Blocks</b>	28,181,188
	<b>Operating Temperature</b>	32° to 158°F (0° to 70°C) [ambient temp]
	<b>Features</b>	L1.2

Must be configured with either a standard Hard Disk Drive or Solid-State Hybrid Drive. Cannot be configured with an additional M.2

<b>2 TB 5400 rpm SATA Hard Disk Drive</b>	<b>Drive Weight</b>	0.21 lbs ( 95 g)
	<b>Capacity</b>	2 TB
	<b>Height</b>	0.28 in (7 mm)
	<b>Width</b>	2.75 in (69.85 mm)
	<b>Interface</b>	ATA-8, SATA 3.0
	<b>Transfer Rate</b>	<b>Synchronous</b> (maximum) 600 MB/s
	<b>Seek Time</b> (typical reads, including settling)	<b>Single Track</b> 1.5 ms
		<b>Average</b> 13 ms
		<b>Maximum</b> 32 ms
	<b>Cache</b>	128 MB
	<b>Rotational Speed</b>	5400 rpm
	<b>Logical Blocks</b>	3,907,029,168
<b>Operating Temperature</b>	32° to 140° F (0° to 60° C) [case temp]	
<b>Features</b>	ATA Security, S.M.A.R.T., NCQ, Ultra DMA	

<b>500 GB 7200 rpm SATA Hard Disk Drive</b>	<b>Drive Weight</b>	0.21 lbs ( 95 g)
	<b>Capacity</b>	500 GB
	<b>Height</b>	0.28 in (7 mm)
	<b>Width</b>	2.75 in (69.85mm)
	<b>Interface</b>	ATA-8, SATA 3.0
	<b>Transfer Rate</b>	<b>Synchronous</b> (maximum) 600 MB/s (Drive Capability)
	<b>Seek Time</b> (typical reads, including settling)	<b>Single Track</b> 1.5 ms ~ 2 ms
		<b>Average</b> 11 ms ~ 13 ms
		<b>Maximum</b> 18 ms ~ 22 ms
	<b>Cache</b>	Up To 32 MB
<b>Rotational Speed</b>	7200 rpm	

### Technical Specifications – Storage and Drives

	<b>Logical Blocks</b>	976,773,168	
	<b>Operating Temperature</b>	32° to 140° F (0° to 60° C) [top cover temp]	
	<b>Features</b>	ATA Security, S.M.A.R.T., NCQ, Ultra DMA	
<b>1 TB 7200 rpm SATA Hard Disk Drive</b>	<b>Drive Weight</b>	0.21 lbs (95 g)	
	<b>Capacity</b>	1 TB	
	<b>Height</b>	0.28 in (7 mm)	
	<b>Width</b>	2.75 in (69.85mm)	
	<b>Interface</b>	ATA-8, SATA 3.0	
	<b>Transfer Rate</b>	<b>Synchronous (maximum)</b> 600 MB/s (Drive Capability)	
	<b>Seek Time</b> (typical reads, including settling)	<b>Single Track</b>	1.5 ms
		<b>Average</b>	13 ms
		<b>Maximum</b>	32 ms
	<b>Cache</b>	128 MB	
	<b>Rotational Speed</b>	7200 rpm	
	<b>Logical Blocks</b>	1,953,525,168	
	<b>Operating Temperature</b>	32° to 140° F (0° to 60° C) [top cover temp]	
<b>Features</b>	ATA Security, S.M.A.R.T., NCQ, Ultra DMA		
<b>500 GB Hybrid Drive, 8 GB cache</b>	<b>Drive Weight</b>	0.20 lbs (92 g) ~ 0.21 lbs (95 g)	
	<b>Capacity</b>	500 GB	
	<b>Height</b>	0.28 in (7 mm)	
	<b>Width</b>	2.75 in (69.85 mm)	
	<b>Interface</b>	ATA-8, SATA 3.0	
	<b>Transfer Rate</b>	<b>Synchronous (maximum)</b> 600 MB/s	
	<b>Seek Time</b> (typical reads, including settling)	<b>Single Track</b>	2 ms
		<b>Average</b>	12 ms
		<b>Maximum</b>	22 ms
	<b>Cache</b>	Up to 64MB	
	<b>Rotational Speed</b>	5400 rpm	
	<b>Logical Blocks</b>	976,773,168	
	<b>Operating Temperature</b>	32° to 140° F (0° to 60° C) [case temp]	
<b>Features</b>	ATA Security, S.M.A.R.T., NCQ, Ultra DMA		
<b>1 TB Hybrid Drive, 8 GB cache</b>	<b>Drive Weight</b>	90g	
	<b>Capacity</b>	1 TB	
	<b>Height</b>	0.28 in (7 mm)	
	<b>Width</b>	2.75 in (69.85 mm)	
	<b>Interface</b>	ATA-8, SATA 3.0	
	<b>Transfer Rate</b>	<b>Synchronous (maximum)</b> 600 MB/s	
	<b>Seek Time</b> (typical reads, including settling)	<b>Single Track</b>	1.5 ms
		<b>Average</b>	13 ms
		<b>Maximum</b>	32 ms
	<b>Cache</b>	Up to 128MB	
	<b>Rotational Speed</b>	5400 rpm	
	<b>Logical Blocks</b>	1,953,525,168	

### Technical Specifications – Storage and Drives

<b>2 TB Hybrid Drive, 8 GB cache</b>	<b>Operating Temperature</b>	32° to 140° F (0° to 60° C) [case temp]		
	<b>Features</b>	ATA Security, S.M.A.R.T., NCQ, Ultra DMA		
	<b>Drive Weight</b>	90g		
	<b>Capacity</b>	2 TB		
	<b>Height</b>	0.28 in (7 mm)		
	<b>Width</b>	2.75 in (69.85 mm)		
	<b>Interface</b>	ATA-8, SATA 3.0		
	<b>Transfer Rate</b>	<b>Synchronous (maximum)</b>	600 MB/s	
	<b>Seek Time (typical reads, including settling)</b>	<b>Single Track</b>	1.5 ms	
		<b>Average</b>	13 ms	
		<b>Maximum</b>	32 ms	
	<b>Cache</b>	Up to 128MB		
	<b>Rotational Speed</b>	5400 rpm		
	<b>Logical Blocks</b>	3,907,029,168		
	<b>Operating Temperature</b>	32° to 140° F (0° to 60° C) [case temp]		
<b>Features</b>	ATA Security, S.M.A.R.T., NCQ, Ultra DMA			
<b>500 GB 7200 rpm SATA SED FIPS* 140-2 compliant Hard Disk Drive</b>	<b>Drive Weight</b>	0.21 lbs (95g)		
	<b>Capacity</b>	500 GB		
	<b>Height</b>	0.28 in (7 mm)		
	<b>Width</b>	2.75 in (69.85 mm)		
	<b>Interface</b>	ATA-8, SATA 3.0		
	<b>Transfer Rate</b>	<b>Synchronous (maximum)</b>	600 MB/s (Drive Capability)	
	<b>Seek Time (typical reads, including settling)</b>	<b>Single Track</b>	1.5 ms	
		<b>Average</b>	12 ms	
		<b>Maximum</b>	21 ms	
	<b>Cache</b>	32 GB		
	<b>Rotational Speed</b>	7200 rpm		
	<b>Logical Blocks</b>	976,773,168		
	<b>Operating Temperature</b>	32° to 140° F (0° to 60° C) [top cover temp]		
	<b>Features</b>	ATA Security; TCG Opal 2.x, FIPS, S.M.A.R.T., NCQ, Ultra DMA		
		* FIPS-certified, hardware-based AES-256 encryption image.		
<b>500 GB 7200 rpm SATA SED Hard Disk Drive</b>	<b>Drive Weight</b>	0.21 lbs (95g)		
	<b>Capacity</b>	500 GB		
	<b>Height</b>	0.28 in (7 mm)		
	<b>Width</b>	2.75 in (69.85 mm)		
	<b>Interface</b>	ATA-8, SATA 3.0		
	<b>Transfer Rate</b>	<b>Synchronous (maximum)</b>	600 MB/s (Drive Capability)	
	<b>Seek Time (typical reads, including settling)</b>	<b>Single Track</b>	1.5 ms	
		<b>Average</b>	12 ms	
		<b>Maximum</b>	21 ms	
	<b>Cache</b>	32 MB		
	<b>Rotational Speed</b>	7200 rpm		
	<b>Logical Blocks</b>	976,773,168		
	<b>Operating Temperature</b>	32° to 140° F (0° to 60° C) [case temp]		



### Technical Specifications – Storage and Drives

**Features** ATA Security, TCG Opal 2.x, S.M.A.R.T., NCQ, Ultra DMA

#### 256 GB SATA TLC Solid State Drive (2.5")

<b>Drive Weight</b>	0.17 lb (78 g)	
<b>Capacity</b>	256 GB	
<b>Height</b>	0.28 in (7 mm)	
<b>Width</b>	2.75 in (69.85 mm)	
<b>Interface</b>	ATA-8, SATA 3.0	
<b>NAND Type</b>	TLC	
<b>Form-Factor (I/O)</b>	2.5 inch	
<b>Performance</b>	<b>Maximum Sequential Read</b>	<b>Maximum Sequential Write</b>
	530 MB/s ~ 560 MB/s	500 MB/s ~ 525 MB/s
<b>Logical Blocks</b>	500,118,192	
<b>Operating Temperature</b>	32° to 158°F (0° to 70°C) [ambient temp]	
<b>Features</b>	ATA Security; DIPM; TRIM; DEVSLP	

#### 1 TB SATA TLC Solid State Drive (2.5")

<b>Drive Weight</b>	0.17 lb (78 g)	
<b>Capacity</b>	1 TB	
<b>Height</b>	0.28 in (7 mm)	
<b>Width</b>	2.75 in (69.85 mm)	
<b>Interface</b>	ATA-8, SATA 3.0	
<b>NAND Type</b>	TLC	
<b>Form-Factor (I/O)</b>	2.5 inch	
<b>Performance</b>	<b>Maximum Sequential Read</b>	<b>Maximum Sequential Write</b>
	530 MB/s ~ 560 MB/s	500 MB/s ~ 530 MB/s
<b>Logical Blocks</b>	2,000,409,264	
<b>Operating Temperature</b>	32° to 158°F (0° to 70°C) [ambient temp]	
<b>Features</b>	ATA Security; DIPM; TRIM; DEVSLP	

#### 256 GB M.2 Self-Encrypting Drive TLC Solid State Drive

<b>Drive Weight</b>	0.02 lb (<10 g)	
<b>Capacity</b>	256 GB	
<b>Height</b>	0.09 in (2.3 mm)	
<b>Width</b>	0.87 in (22 mm)	
<b>Interface</b>	ACS-3, SATA 3.2	
<b>NAND Type</b>	TLC	
<b>Form-Factor (I/O)</b>	M.2 2280	
<b>Interface</b>	ATA-8, SATA 3.0	
<b>Performance</b>	<b>Maximum Sequential Read</b>	<b>Maximum Sequential Write</b>
	530 MB/s ~ 560 MB/s	500 MB/s ~ 530 MB/s
<b>Logical Blocks</b>	500,118,192	
<b>Operating Temperature</b>	32° to 158°F (0° to 70°C) [ambient temp]	

### Technical Specifications – Storage and Drives

**Features** ATA Security; TCG Opal 2.0, DIPM; TRIM; DEVSLP

<b>256 GB M.2 NVMe TLC Solid State Drive</b>	<b>Drive Weight</b>	0.02 lb (<10 g)		
	<b>Capacity</b>	256 GB		
	<b>Height</b>	0.09 in (2.3 mm)		
	<b>Width</b>	0.87 in (22 mm)		
	<b>Generation</b>	Samsung PM961/ Toshiba XG5		
	<b>NAND Type</b>	TLC		
	<b>Form-Factor (I/O)</b>	M.2 2280		
	<b>Interface</b>	PCIe NVMe Gen3X4		
	<b>Performance</b>	<b>Maximum Sequential Read</b>	<b>Maximum Sequential Write</b>	
		2580 MB/s ~ 2600 MB/s	1000 MB/s ~ 1100 MB/s	
<b>Logical Blocks</b>	500,118,192			
<b>Operating Temperature</b>	32° to 158°F (0° to 70°C) [ambient temp]			
<b>Features</b>	ATA Security (Option), TRIM; L1.2			

<b>256 GB M.2 NVMe TLC SED Solid State Drive</b>	<b>Drive Weight</b>	0.02 lb (<10 g)		
	<b>Capacity</b>	256 GB		
	<b>Height</b>	0.09 in (2.3 mm)		
	<b>Width</b>	0.87 in (22 mm)		
	<b>Generation</b>	Samsung PM961 SED Opal2/ Toshiba XG5 SED Opal2		
	<b>NAND Type</b>	TLC		
	<b>Form-Factor (I/O)</b>	M.2 2280		
	<b>Interface</b>	PCIe NVMe Gen3X4		
	<b>Performance</b>	<b>Maximum Sequential Read</b>	<b>Maximum Sequential Write</b>	
		2580 MB/s ~ 2600 MB/s	Up to 1000 MB/s	
<b>Logical Blocks</b>	500,118,192			
<b>Operating Temperature</b>	32° to 158°F (0° to 70°C) [ambient temp]			
<b>Features</b>	ATA Security (Option); TCG Opal 2.0; TRIM; L1.2			

<b>512 GB M.2 NVMe TLC Solid State Drive</b>	<b>Drive Weight</b>	0.02 lb (<10 g)		
	<b>Capacity</b>	512 GB		
	<b>Height</b>	0.09 in (2.3 mm)		
	<b>Width</b>	0.87 in (22 mm)		
	<b>Generation</b>	Samsung PM981 / Toshiba XG5		
	<b>NAND Type</b>	TLC		
	<b>Form-Factor (I/O)</b>	M.2 2280		
	<b>Interface</b>	PCIe NVMe Gen3X4		
	<b>Performance</b>	<b>Maximum Sequential Read</b>	<b>Maximum Sequential Write</b>	

### Technical Specifications – Storage and Drives

		2800 MB/s ~ 2900 MB/s	1000 MB/s ~ 1800 MB/s	
	<b>Logical Blocks</b>	1,000,215,215		
	<b>Operating Temperature</b>	32° to 158°F (0° to 70°C) [ambient temp]		
	<b>Features</b>	ATA Security, TRIM; L1.2		
<hr/>				
<b>512 GB M.2 NVMe TLC Solid State Drive</b>	<b>Drive Weight</b>	0.02 lb (<10 g)		
	<b>Capacity</b>	512 GB		
	<b>Height</b>	0.09 in (2.3 mm)		
	<b>Width</b>	0.87 in (22 mm)		
	<b>Generation</b>	Samsung PM981 SED Opal2/ Toshiba XG5 SED Opal2		
	<b>NAND Type</b>	TLC		
	<b>Form-Factor (I/O)</b>	M.2 2280		
	<b>Interface</b>	PCIe NVMe Gen3X4		
	<b>Performance</b>	<b>Maximum Sequential Read</b>	<b>Maximum Sequential Write</b>	
		2800 MB/s ~ 2900 MB/s	1000 MB/s ~ 1800 MB/s	
	<b>Logical Blocks</b>	1,000,215,215		
	<b>Operating Temperature</b>	32° to 158°F (0° to 70°C) [ambient temp]		
	<b>Features</b>	ATA Security (Option); TCG Opal 2.0; TRIM; L1.2		
<hr/>				
<b>1 TB, M.2 NVMe TLC Solid State Drive</b>	<b>Drive Weight</b>	0.02 lb (<10 g)		
	<b>Capacity</b>	1 TB		
	<b>Height</b>	0.09 in (2.3 mm)		
	<b>Width</b>	0.87 in (22 mm)		
	<b>Generation</b>	Samsung PM981 / Toshiba XG5		
	<b>NAND Type</b>	TLC		
	<b>Form-Factor (I/O)</b>	M.2 2280		
	<b>Interface</b>	PCIe NVMe Gen3X4		
	<b>Performance</b>	<b>Maximum Sequential Read</b>	<b>Maximum Sequential Write</b>	
		2900 MB/s ~ 3000 MB/s	Up to 2000MB/s	
	<b>Logical Blocks</b>	2,000,409,264		
	<b>Operating Temperature</b>	32° to 158°F (0° to 70°C) [ambient temp]		
	<b>Features</b>	ATA Security, TRIM; L1.2		
	<b>Available in RAID 1 config**</b>	Yes		
<hr/>				
<b>2 TB, M.2 NVMe TLC Solid State Drive</b>	<b>Drive Weight</b>	0.02 lb (<10 g)		
	<b>Capacity</b>	2 TB		
	<b>Height</b>	0.09 in (2.3 mm)		
	<b>Width</b>	0.87 in (22 mm)		
	<b>Generation</b>	Toshiba XG5P		
	<b>NAND Type</b>	TLC		

### Technical Specifications – Storage and Drives

<b>Form-Factor (I/O)</b>	M.2 2280	
<b>Interface</b>	PCIe NVMe Gen3X4	
<b>Performance</b>	<b>Maximum Sequential Read</b>	<b>Maximum Sequential Write</b>
	Up to 2900MB/s	Up to 2100 MB/s
<b>Logical Blocks</b>	3,907,029,168	
<b>Operating Temperature</b>	32° to 158°F (0° to 70°C) [ambient temp]	
<b>Features</b>	ATA Security, TRIM; L1.2	
<b>Available in RAID 1 config**</b>	Yes	

\*For storage drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 30 GB (for Windows® 10) disk is reserved for system recovery software.

\*\* RAID 1 Configuration requires 2 NVMe PCIe M.2 drives; both drives must be the same capacity and only available on NVMe technology. Available December 2018

### Technical Specifications – Networking/Communications

#### NETWORKING/COMMUNICATIONS

<p><b>Intel® Dual Band Wireless-N 9560AC 802.11 a/b/g/n (2x2) WiFi + Bluetooth 5.0 Combo Adaptor*</b></p>	<p><b>Wireless LAN Standards</b></p>	<p>IEEE 802.11a          IEEE 802.11b          IEEE 802.11g          IEEE 802.11n          IEEE 802.11ac</p>
	<p><b>Interoperability</b></p>	<p>Wi-Fi certified</p>
	<p><b>Frequency Band</b></p>	<p>802.11b/g/n           802.11a/n</p>
		<p>2.402 - 2.482 GHz  <b>Note:</b> The FCC has declared as of January 1, 2015 products that utilize passive scanning on channel 12/13 and are capable of transmitting must fully comply with requirements of 15.247 or otherwise disable those channels.           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>Note:</b> No support for this band in Indonesia</p>
	<p><b>Data Rates</b></p>	<p>802.11a: 6, 9, 12, 18, 24, 36, 48, 54 Mbps          802.11b: 1, 2, 5.5, 11 Mbps          802.11g: 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, and 80MHz)</p>
	<p><b>Modulation</b></p>	<p>Direct Sequence Spread Spectrum          CCK, BPSK, QPSK, 16-QAM, 64-QAM, 256-QAM</p>
	<p><b>Security<sup>1</sup></b></p>	<ul style="list-style-type: none"> <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> <li>• Cisco Certified Extensions, all versions through CCX4 and CCX Lite</li> <li>• WAPI</li> </ul>
	<p><b>Network Architecture Models</b></p>	<p>Ad-hoc (Peer to Peer)          Infrastructure (Access Point Required)</p>
	<p><b>Roaming</b></p>	<p>IEEE 802.11 compliant roaming between band Access Points</p>
	<p><b>Output Power<sup>2</sup></b></p>	<p>802.11b : +16dBm minimum          802.11g : +14dBm minimum          802.11a : +14dBm minimum          802.11n HT20(2.4GHz) : +14dBm minimum          802.11n HT40(2.4GHz) : +12dBm minimum          802.11n HT20(5GHz) : +14dBm minimum          802.11n HT40(5GHz) : +12dBm minimum</p>
	<p><b>Power Consumption</b></p>	<p>Transmit: 2.0 Watts          Receive: 1.6 Watts          Idle mode: 180 mW (WLAN Associated)</p>

### Technical Specifications – Networking/Communications

	Idle mode: 50 mW (WLAN unassociated) Connect Standby: 10 mW (WLAN+BT) Radio disabled: 5 mW
<b>Power Management</b>	ACPI and PCI Express compliant power management 802.11 compliant power saving mode
<b>Receiver Sensitivity<sup>3</sup></b>	802.11b, 1Mbps : -94dBm maximum 802.11b, 11Mbps : -86dBm maximum 802.11g, 6Mbps : -88dBm maximum 802.11g, 54Mbps : -74dBm maximum 802.11a, 6Mbps : -88dBm maximum 802.11a, 54Mbps : -74dBm maximum 802.11n, MCS07 : -69dBm maximum 802.11n, MCS15 : -66dBm maximum 802.11ac, 1SS, MCS-0 : -86dBm maximum 802.11ac, 1SS, MCS-9 : -61dBm maximum 802.11ac, 2SS, MCS-0 : -83dBm maximum 802.11ac, 2SS, MCS-9 : -58dBm 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 Or Type 1630 : 2.3 x 16.0 x 30.0 mm
<b>Weight</b>	Type 2230 : 2.8g Or Type 1630 : 2g
<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

1. Check latest software/driver release for updates on supported security features.
2. Maximum output power may vary by country according to local regulations.
3. Receiver sensitivity is measured at a packet error rate of 8% for 802.11b (CKK modulation) and a packet error rate of 10% for 802.11a/g (OFDM modulation).

\* Wireless access point and internet service required. Availability of public wireless access points limited.

#### HP Integrated Module with Bluetooth 4.2 Wireless Technology

<b>Bluetooth Specification</b>	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

### Technical Specifications – Networking/Communications

<b>Transmit Power</b>	Legacy : Synchronous Connection Oriented links up to 3, 64 kbps, voice channels												
<b>Receiver Sensitivity</b>	Legacy : Asynchronous Connection Less links 2178.1 kbps/177.1 kbps asymmetric (3-DH5) or 864 kbps symmetric (3-EV5) 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>	<table border="1"> <thead> <tr> <th>Modulation</th> <th>0.01% BER</th> <th>0.001% BER</th> </tr> </thead> <tbody> <tr> <td>GFSK</td> <td>-80 dBm</td> <td>-70 dBm</td> </tr> <tr> <td><math>\pi/4</math>-DQPSK</td> <td>-80 dBm</td> <td>-70 dBm</td> </tr> <tr> <td>8DPSK</td> <td>-80 dBm</td> <td>-70 dBm</td> </tr> </tbody> </table>	Modulation	0.01% BER	0.001% BER	GFSK	-80 dBm	-70 dBm	$\pi/4$ -DQPSK	-80 dBm	-70 dBm	8DPSK	-80 dBm	-70 dBm
Modulation	0.01% BER	0.001% BER											
GFSK	-80 dBm	-70 dBm											
$\pi/4$ -DQPSK	-80 dBm	-70 dBm											
8DPSK	-80 dBm	-70 dBm											
<b>Range</b>	Peak (Tx) 330 mW Peak (Rx) 230 mW Selective Suspend 17 mW Legacy Up to 33 ft (10 m) BLE Up to 99 ft (30 m)												
<b>Electrical Interface</b>	USB 2.0 compliant												
<b>Bluetooth Software Supported</b>	Microsoft Windows® Bluetooth Software												
<b>Link Topology</b>	Point to Point, Multipoint Pico Nets up to 7 slaves												
<b>Security</b>	Full support of Bluetooth Security Provisions												
<b>Power Management</b>	Microsoft Windows® ACPI, and USB Bus Support Self-configurable to optimize power conservation in all operating modes, including Standby, Hold, Park, and Sniff												
<b>Certifications</b>	All necessary regulatory approvals for supported countries, including: FCC (47 CFR) Part 15C, Section 15.247 & 15.249 ETS 300 328, ETS 300 826 Low Voltage Directive IEC950 UL, CSA, and CE Mark												
<b>Bluetooth Profiles Supported</b>	Serial Port Profile (SPP) Service Discovery Application Profile (SDAP) Dial-Up Networking (DUN) Generic Object Exchange Profile (GOEP) Object Push Profile (OPP) Hard Copy Cable Replacement (HCRP) Personal Area Networking Profile (PAN) Human Interface Device Profile (HID) Hands Free Profile (HFP) Advanced Audio Distribution Profile (A2DP) Audio Video Remote Control Profile (AVRCP)												

**Near Field Communications (NFC) Controller (optional)**

**Controller Supports**

NFC Mirage WNC XRAV-1 (NXP NPC300 I2C 10mmx17mm)

- Windows 8, Proximity Events
- Windows 7, PC/SC
- NFC Forum Compliant
- Near Field Communications Controller

**Dimensions (L x W x H)**

Module 25 mm by 10 mm by 2.0 mm

### Technical Specifications – Networking/Communications

<b>Chipset</b>	NPC100	
<b>System interface</b>	I2C	
<b>NFC RF standards</b>	standards ISO/IEC 14443 A ISO/IEC 14443 B ISO/IEC 15693 ISO/IEC 18092 ECMA-340 NFCIP-1 Target and Initiator ECMA-320 NFCIP-2	
<b>NFC Forum Support Tag Reader</b>	Type 1, Type 2, Type3 and Type 4, NFCIP-1 and NFCIP-2 (PCD-VCD) Mode(1) ISO/IEC 14443 A ISO/IEC 14443 B ISO/IEC 15693 MIFARE 1K MIFARE 4K MIFARE DESFire FeliCa Jewel and Topaz cards	
<b>Card Emulation Mode</b>	(PICCVICC) ISO/IEC 14443 A ISO/IEC 14443 B and B' MIFARE FeliCa	
<b>Frequency</b>	13.56 MHz	
<b>NFC Modes Supported</b>	Reader/Writer, Peer-to-Peer	
<b>Raw RF Data Rates</b>	106, 212, 424, 848 kbps	
<b>Operating temperature</b>	0°C to 70°C	
<b>Storage temperature</b>	-20°C to 125°C	
<b>Humidity</b>	10-90% operating 5-95% non-operating	
<b>Supply Operating voltage</b>	2.97 to 5.5 Volts	
<b>I/O Voltage</b>	1.8V or 3.3V	
<b>Power Consumption</b>	<b>Booster enable, VCC_BOOST = 5V) Mode Power Consumption,</b>	VBAT= 3.3V, Typical <sup>2</sup> Polling 7.3 mA Detected Test Tag Type 1 Total 283.8 mA Net Module 236.8 mA Detected Test Tag Type 2 Total 288.8 mA Net Module 241.8 mA Detected Test Tag Type 3 Total 287.7 mA Net Module 240.7 mA Detected Test Tag Type 4 Total 282.3 mA Net Module 235.3 mA
<b>Antenna connector</b>	0.5mm pitch, 7 connector FPC. Antenna matching is external to module.	
<b>Notes</b>	<ol style="list-style-type: none"> <li>1. With application or UICC support</li> <li>2. Actual Power Consumption is dependent on NFC antenna and matching circuit and on the particular polling sequence and period configured.</li> </ol>	



### Technical Specifications – Audio/Multimedia

#### AUDIO/MULTIMEDIA – BANG & OLUFSEN

<b>Hardware</b>	<b>Implementation</b>	Synaptics CX8400 with two NXP TFA9891 discrete smart amplifiers
	<b>Function Key</b>	Volume up, volume down, and mute
	<b>Volume Controls</b>	
	<b>Full Duplex</b>	Yes
	<b>Microphone In</b>	Stereo
	<b>Headphone/Line Out</b>	Stereo
	<b>Integrated Microphone</b>	Yes, (1) dual-array digital microphone and (1) HP World Facing Microphone when equipped with optional webcam
<b>Audio Output Quality</b>	<b>Frequency Response</b>	20 Hz - 20 kHz
	<b>Signal to Noise Ratio</b>	106dB (DAC), 102dB (ADC)
	<b>Total Harmonic Distortion</b>	91dB THD+n on LineOut/HP (0.003%)
	<b>Noise Floor</b>	-110 dB
	<b>Play Sampling Rate(s)</b>	Up to 192kHz
	<b>Record Sampling Rate(s)</b>	Up to 96kHz
	<b>DAC</b>	16, 20 or 24-bit
	<b>ADC</b>	16, 20 or 24-bit
<b>Internal Stereo Speaker</b>	<b>Power Rating</b>	1 Watt/per top speaker
		2 Watt/ bottom speaker
	<b>Impedance</b>	8 ohms/per top speaker 4 ohms/per bottom speaker

### Technical Specifications – Power

#### POWER

<b>HP 150W Slim Smart AC Adapter</b>	<b>Dimensions</b>	6.02 x 2.60 x .87 in ((153 x 66 x 22 mm)	
	<b>Weight</b>	0.71 lbs (320 g)	
	<b>Input</b>	100 to 240 VAC	
		Input Efficiency	88% min at 115 VAC
		Input frequency range	47 to 63 Hz
		Input AC current	2.9 A at 90 VAC, 1.45 A at 180 VAC
	<b>Output</b>	Output power	150W
		DC output	19.5V
		Hold-up time	5 msec at 115 VAC input
		Output current limit	<16A, Over voltage protection- 29V max automatic shutdown
	<b>Connector</b>	3 pin/grounded, mates with interchangeable cords	
	<b>Environmental Design</b>	Operating temperature	32° to 104° F (0° to 40° C)
		Non-operating (storage) temperature	-4° to 149° F (-20° to 65° C)
		Altitude	0 to 10,000 ft (0 to 3,048 m)
		Humidity	20% to 80%
	Storage Humidity	10% to 90%	
<b>EMI and Safety Certifications</b>	CE Mark- full compliance with LVD and EMC directives; Worldwide safety standards- IEC950, EN60950, UL1950, Class 1, SELV; Agency approvals- C-UL-US, NORDICS, DENAN, EN55022 Class B, FCC Class B, CISPR22 Class B, CCIB, NOM-1 NYCE; MTBF- over 200,000 hours at 25°C ambient condition.		

<b>HP Long Life 4-cell Polymer Battery (64 WHr)</b>	<b>Dimensions (H x W x L)</b>	7.9 x 3.49 x 0.32 in (20.08 x 8.86 x 0.81cm)	
	<b>Weight (max)</b>	0.619lb (281g)	
	<b>Cells/Type</b>	4-cell; Polymer	
	<b>Energy</b>	Voltage	15.4V
		Amp-hour capacity	4.155Ah
		Watt-hour capacity	64Wh
	<b>Temperature</b>	Operating (Charging)	32° to 113° F (0° to 45° C)
		Operating (Discharging)	14° to 140° F (-10° to 60° C)
		Non-operating	-4° to 140° F (-20° to 60° C)
	<b>Battery Re-Charge Time</b>	System in OFF or Standby Mode	3 hours
	System ON	3 to 5 hours	
<b>Fuel Gauge LED</b>	No		
<b>Warranty*</b>	3 year		

\* 3-year platform warranty is required for a 3-year Long Life Battery warranty.

<b>Dimensions (H x W x L)</b>	13.02 x 3.51 x 0.319 in (33.08 x 8.92 x 0.81cm)
-------------------------------	---

### Technical Specifications – Power

<b>HP Long Life 6-cell Polymer Battery (96 WHr)</b>	<b>Weight (max)</b>	1.12lb (420g)		
	<b>Cells/Type</b>	6-cell; Polymer		
	<b>Energy</b>	Voltage	11.55V	
		Amp-hour capacity	8.31Ah	
		Watt-hour capacity	95Wh	
	<b>Temperature</b>	Operating (Charging)	32° to 122°F (0° to 50° C)	
		Operating (Discharging)	14° to 140°F (-10° to 60° C)	
		Non-operating	>140° F (>60° C)	
	<b>Battery Re-Charge Time</b>	System in OFF or Standby Mode	3 hours	
		System ON	3 to 5 hours	
	<b>Fuel Gauge LED</b>	No LED		
<b>Warranty*</b>	3 year			

\* 3-year platform warranty is required for a 3-year Long Life Battery warranty.

### Technical Specifications – Environmental

#### ENVIRONMENTAL DATA

##### Eco-Label Certifications & declarations

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:

- IT ECO declaration
- US ENERGY STAR®
- US Federal Energy Management Program (FEMP)
- EPEAT® GOLD registered in the United States. See <http://www.epeat.net> for registration status in your country.

##### System Configuration

The configuration used for the Energy Consumption and Declared Noise Emissions data for the Notebook model is based on a “Typically Configured Notebook”.

##### Energy Consumption (in accordance with US ENERGY STAR® test method)

	115VAC, 60Hz	230VAC, 50Hz	100VAC, 50Hz
Normal Operation (Sort idle)	11.20 W	10.51 W	11.24 W
Normal Operation (Long idle)	6.70 W	6.30 W	6.37 W
Sleep	1.13 W	1.12 W	1.14 W
Off	0.41 W	0.43 W	0.42 W

##### Note:

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.

##### Heat Dissipation\*

	115VAC, 60Hz	230VAC, 50Hz	100VAC, 50Hz
Normal Operation (Short idle)	38 BTU/hr	36 BTU/hr	38 BTU/hr
Normal Operation (Long idle)	23 BTU/hr	22 BTU/hr	22 BTU/hr
Sleep	4 BTU/hr	4 BTU/hr	4 BTU/hr
Off	1.4 BTU/hr	1 BTU/hr	1 BTU/hr

\*NOTE: Heat dissipation is calculated based on the measured watts, assuming the service level is attained for one hour.

##### Declared Noise Emissions (in accordance with ISO 7779 and ISO 9296)

	Sound Power (L <sub>WAd</sub> , bels)	Sound Pressure (L <sub>pAm</sub> , decibels)
Typically Configured – Idle	3.2	22
Fixed Disk – Random writes	3.2	21

##### Longevity and Upgrading

This product can be upgraded, possibly extending its useful life by several years. Upgradeable features and/or components contained in the product may include:

- 2 USB ports
- 2 Thunderbolt™ 3 ports
- 1 2.5" Storage Bay Drive
- 2 M.2 SATA SED Solid State Drives

### Technical Specifications – Environmental

- 2 SODIMM memory slots
- 1 HDMI 2.0 port

Spare parts are available throughout the warranty period and or for up to “5” years after the end of production.

#### Batteries

This battery(s) in this product comply with EU Directive 2006/66/EC

Batteries used in the product do not contain:  
Mercury greater than 1ppm by weight  
Cadmium greater than 20ppm by weight

Battery size: CR2032 (coin cell)  
Battery type: Polymer  
Battery size: 4-cell or 6-cell high capacity Polymer battery

#### Additional Information

- This product is in compliance with the Restrictions of Hazardous Substances (RoHS) directive - 2011/65/EC.
- This HP product is designed to comply with the Waste Electrical and Electronic Equipment (WEEE) Directive – 2002/96/EC.
- This product is in compliance with California Proposition 65 (State of California; Safe Drinking Water and Toxic Enforcement Act of 1986).
- This product is in compliance with the IEEE 1680 (EPEAT) standard at the Gold level, see [www.epeat.net](http://www.epeat.net)
- Plastics parts weighing over 25 grams used in the product are marked per ISO11469 and ISO1043.
- This product contains 0.0% post-consumer recycled plastic (by wt.)
- This product is 95.6% recycle-able when properly disposed of at end of life.

#### Packaging Materials

<b>External:</b>	PAPER/Corrugated	383 g
<b>Internal:</b>	PLASTIC/Polyethylene Expanded - EPE	90 g
	PLASTIC/Polyethylene low density - LDPE	10 g
	PLASTIC/Polypropylene - PP	5 g

The plastic packaging material contains at least 81.5% recycled content.

The corrugated paper packaging materials contains at least 80 % recycled content.

#### Material Usage

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 <http://www.hp.com/hpinfo/globalcitizenship/environment/pdf/gse.pdf>):

- Asbestos
- Certain Azo Colorants
- Certain Brominated Flame Retardants – may not be used as flame retardants in plastics
- Cadmium
- Chlorinated Hydrocarbons
- Chlorinated Paraffins
- Formaldehyde
- Halogenated Diphenyl Methanes
- Lead carbonates and sulfates
- Lead and Lead compounds
- Mercuric Oxide Batteries

### Technical Specifications – Environmental

- Nickel – finishes must not be used on the external surface designed to be frequently handled or carried by the user.
- Ozone Depleting Substances
- Polybrominated Biphenyls (PBBs)
- Polybrominated Biphenyl Ethers (PBBEs)
- Polybrominated Biphenyl Oxides (PBBOs)
- Polychlorinated Biphenyl (PCB)
- Polychlorinated Terphenyls (PCT)
- Polyvinyl Chloride (PVC) – except for wires and cables, and certain retail packaging has been voluntarily removed from most applications.
- Radioactive Substances
- Tributyl Tin (TBT), Triphenyl Tin (TPT), Tributyl Tin Oxide (TBTO)

#### Packaging Usage

HP follows these guidelines to decrease the environmental impact of product packaging:

- Eliminate the use of heavy metals such as lead, chromium, mercury and cadmium in packaging materials.
- Eliminate the use of ozone-depleting substances (ODS) in packaging materials.
- Design packaging materials for ease of disassembly.
- Maximize the use of post-consumer recycled content materials in packaging materials.
- Use readily recyclable packaging materials such as paper and corrugated materials.
- Reduce size and weight of packages to improve transportation fuel efficiency.
- Plastic packaging materials are marked according to ISO 11469 and DIN 6120 standards.

#### End-of-life Management and Recycling

HP Inc. offers end-of-life HP product return and recycling programs in many geographic areas. To recycle your product, please go to: <http://www.hp.com/go/reuse-recycle> or contact your nearest HP sales office. Products returned to HP will be recycled, recovered or disposed of in a responsible manner.

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 HP Inc. web site at: <http://www.hp.com/go/recyclers>. 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.

#### HP Inc. Corporate Environmental Information

For more information about HP's commitment to the environment:

Global Citizenship Report

<http://www.hp.com/hpinfo/globalcitizenship/gcreport/index.html>

Eco-label certifications

<http://www8.hp.com/us/en/hp-information/environment/ecolabels.html>

ISO 14001 certificates:

<http://h20195.www2.hp.com/V2/GetDocument.aspx?docname=c04755842>

and

<http://www.hp.com/hpinfo/globalcitizenship/environment/pdf/cert.pdf>

---

### COUNTRY OF ORIGIN

China

Options and Accessories (sold separately and availability may vary by country)

Type	Description	Part #
<b>Display</b>	Z27x G2 27-inch DreamColor Studio display	2NJ08A4#xxx
	Z32 31.5-inch 4k UHD Display	1AA81A4#xxx
	Z38c 37.5-inch Curved Display	Z4W65A4#xxx
	Z24n G2 24-inch Display	1JS09A4#xxx
	Z27n G2 27-inch Display	1JS10A4#xxx
<b>Memory</b>	HP 4GB DDR4-2666 SODIMM	4VN05AA#ABA
	HP 8GB DDR4-2666 SODIMM	4VN06UT#ABA
	HP 16GB DDR4-2666 SODIMM	4VN07AA/UT#ABA
	HP 8GB DDR4-2666 ECC SODIMM	4UY11AA
	HP 16GB DDR4-2666 ECC SODIMM	4UY12AA
<b>Cases</b>	HP 15.6 Business Top Load– Refresh	2SC66AA
	HP Exec Black Leather 15.6 Top Load	1LG83AA
	HP Slim Ultrabook Messenger (up to 15.6" x .88"/22/5mm)	F3W14AA
	HP Slim Ultrabook Backpack (up to 15.6" x .88"/22/5mm)	F3W16AA
	HP Essential Backpack (up to 15.6")	H1D24AA
	HP Essential Top Load Case (up to 15.6")	H2W17AA#xxx
<b>Docking</b>	HP TB Dock G2 w/Combo Cable	3TR87AA#xxx
	HP Thunderbolt™ Dock 230W G2	2UK38AA
	HP Thunderbolt™ Dock Audio	3AQ21AA
	HP USB-C Mini Dock	1PM64AA
	HP USB-C Universal Dock	1MK33AA
	HP USB-C Dock G4	3FF69AA#xxx
	HP Travel Hub	TOK30AA
	HP 3005pr USB 3.0 Port Replicator w/ USB-C™ Adapter	Y4H06AA
<b>Input/Output - Mice</b>	HP Wireless Premium Mouse	1JR31AA
	HP USB Premium Mouse	1JR32AA
	HP Slim Bluetooth Mouse	F3J92AA#xxx
	HP USB Travel Mouse	G1K28AA#xxx
	HP Comfort Grip Mouse	H2L63AA
	HP X4000 Bluetooth Mouse	H3T50AA#xxx
	HP 3-Button Laser Mouse	H4B81AA#xxx
	HP Ultra Mobile Wireless Mouse	H6F25AA#xxx
	HP Slim Wireless Keyboard and Mouse	T6L04AA
	HP Slim USB Keyboard and Mouse	T6T83AA
HP Wireless (Link-5) Keyboard	T6U20AA	
<b>Power Adapters</b>	HP 150W Slim Smart AC Adapter	4SC18UT#xxx
	HP 200W Slim Smart AC Adapter	4SC19AA/UT#xxx

### Options and Accessories (sold separately and availability may vary by country)

<b>Adapters</b>	HP HDMI to DVI adapter	F5A28AA
	HDMI to VGA Adapter	H4F02AA
	USB 3.0 to RJ45	N7P47AA
	HP USB-C™ to VGA Adapter	N9K76AA
	USB-C to RJ45	V7W66AA
	HP USB-C™ to USB Hub	Z6A00AA
<b>Storage - External Storage</b>	HP 256GB M2 NVME PCIe SSD (2280)	V3K66AA
	HP 512GB M2 NVME PCIe SSD (2280)	V3K67AA
	HP 256GB TLC PCI-e 3x4 NVMe M.2 SSD	1FU87AA
	HP 512GB TLC PCI-e 3x4 NVMe M.2 SSD	1FU88AA
	HP 1TB 2280 M2 PCIe3x4 SS NVME (MLC)	X2E90AA
	HP External USB DVDRW Drive	F2B56AA
<b>Security</b>	HP Nano Keyed Cable Lock	1AJ39AA
	HP Nano Dual Head Keyed Cable Lock	1AJ41AA
	HP Docking Station Cable Lock	AU656AA#XXX
	HP Keyed Cable Lock	TOY14AA
	HP Combination Lock	TOY15AA
	HP Essential Combination Lock	TOY16AA
	HP Keyed Cable Lock 10mm	T1A62AA
	HP Dual Head Cable Lock (Non-Master key)	T1A64AA
	HP Dual Head Cable Lock (Master Key)	T1A65AA
	HP 3-year Next business day onsite Hardware Support w/Accidental Damage Protection-G2 for Notebooks	UF631E
<b>Collaboration</b>	HP Elite Presenter Mouse	ZCE30AA#xxx
	HP UC Conferencing Keyboard	K8P74AA#xxx
	HP Stereo 3.5mm Headset	T1A66AA
	HP Stereo USB Headset	T1A67AA
	HP USB Collaboration Keyboard	Z9N38AA
	HP Wireless Collaboration Keyboard	Z9N39AA#xxx
	HP Wireless Premium Keyboard	Z9N41AA#xxx



### Summary of Changes

<b>Date of change:</b>	<b>Version History:</b>		<b>Description of change:</b>
April 6, 2018	From v1 to v2	Changed	Weight section
June 11, 2018	From v2 to v3	Changed	Operating system, Processor, Graphics, Storage, Wights & Dimensions
June 26, 2018	From v3 to v4	Changed	Processors, Storage and Drives, Software and Security, Power, System Unit sections and format changes
August 27, 2018	From v4 to v5	Changed	Format
August 30, 2018	From v5 to v6	Changed	Intel® Xeon® E-2186M
October 15, 2018	From v6 to v7	Changed	October refresh
August 9, 2019	From v7 to v8	Added	9th Generation Intel Core Processors
September 4, 2019	From v8 to v9	Changed	Processors section
November 4, 2019	From v9 to v10	Changed	At A Glance, DISPLAY, SOFTWARE AND SECURITY sections

Copyright © 2019 HP Development Company, L.P.

The information contained herein is subject to change without notice and is provided "as is" without warranty of any kind. The warranties for HP products are set forth in the express limited warranty statements accompanying such products. Nothing herein should be construed as constituting an additional warranty. HP shall not be liable for technical or editorial errors or omissions contained herein.

Microsoft and Windows are registered trademarks of the Microsoft Group of companies. Intel, Core, vPro, Xeon and Thunderbolt are registered trademarks or trademarks of Intel Corporation in the U.S. and/or other countries. Linux is the registered trademark of Linus Torvalds in the U.S. and other countries. Bluetooth is a registered trademark of its proprietor, used by HP Inc. under license. Adobe is a trademark of Adobe Systems Incorporated. NVIDIA, the NVIDIA logo, Optimus and Quadro are trademarks and/or registered trademarks of NVIDIA Corporation in the U.S. and other countries. ENERGY STAR is a registered trademark of the U.S. Environmental Protection Agency. SD, SDHC, and SDXC, are trademarks or registered trademarks of SD-3C in the United States, other countries or both. USB Type-C and USB-C are trademarks of USB Implementers Forum. DisplayPort™ and the DisplayPort™ logo are trademarks owned by the Video Electronics Standards Association (VESA®) in the United States and other countries.