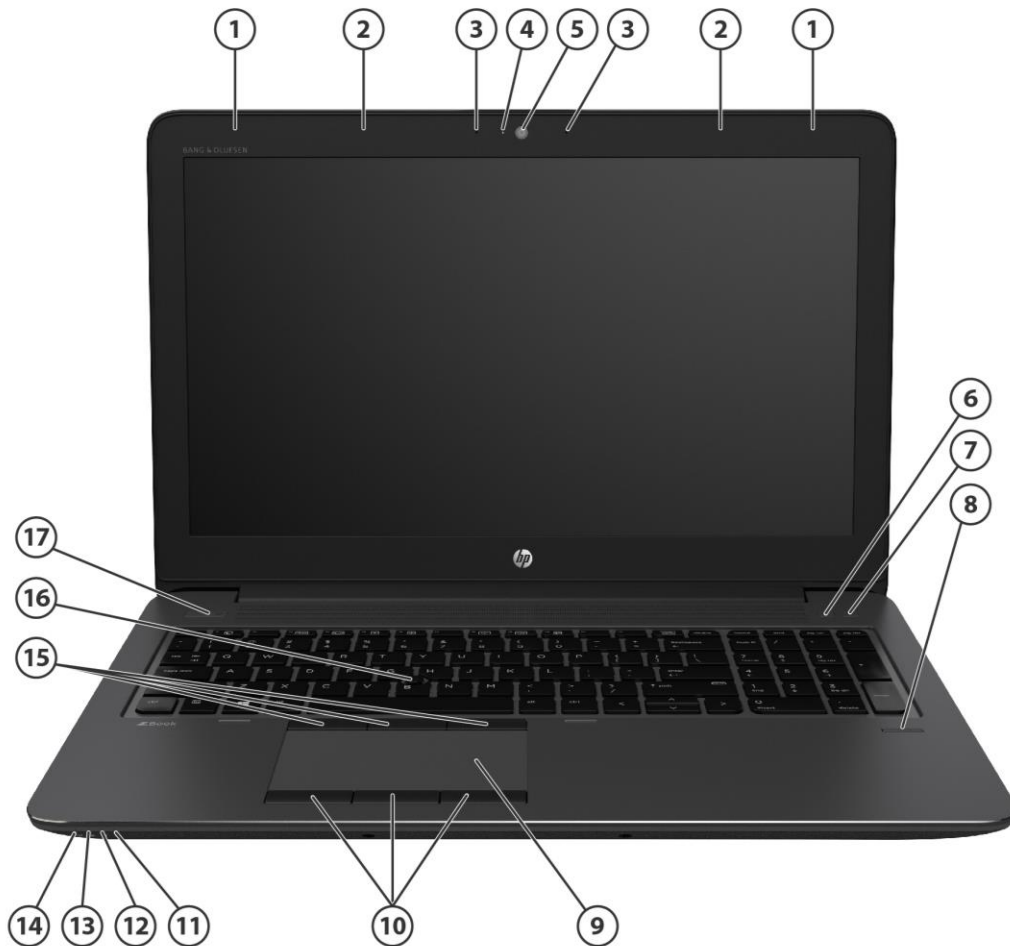


Overview

HP ZBook 15 G4 Mobile Workstation

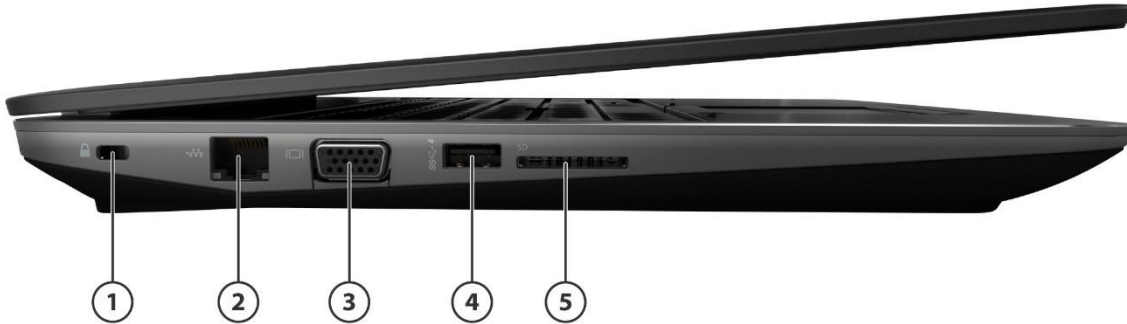
FRONT VIEW



- | | | | |
|----|---|-----|--|
| 1. | WLAN antennas (2) | 9. | Touchpad with scroll zone |
| 2. | WWAN antennas (optional) | 10. | Lower right, center, left touchpad buttons |
| 3. | Internal microphone | 11. | Storage light indicator |
| 4. | Webcam light (with webcam) | 12. | Battery light indicator |
| 5. | Webcam | 13. | Power light indicator |
| 6. | Wireless button | 14. | Wireless light indicator |
| 7. | Volume mute button | 15. | Upper Right, Center, Left Touchpad buttons |
| 8. | Fingerprint reader (select models only) | 16. | Pointstick |
| | | 17. | Power button |

Overview

LEFT VIEW



- | | | | |
|----|---------------------|----|-------------------------|
| 1. | Security cable slot | 4. | USB 3.0 port (charging) |
| 2. | RJ-45 (Ethernet) | 5. | SD Card reader |
| 3. | VGA port | | |

RIGHT VIEW



- | | | | |
|----|---|----|---------------------------|
| 1. | Smart Card reader | 5. | (2) Thunderbolt™ 3* ports |
| 2. | Stereo microphone in / headphone-out combo jack | 6. | Power connector |
| 3. | (2) USB 3.0 Ports | 7. | Power LED |
| 4. | HDMI 1.4 port | | |

Overview

BOTTOM VIEW



1. Speakers

Overview

At A Glance

- Windows® 10 editions, or FreeDOS
- Mainstream full performance industrial design, Casted magnesium-reinforced chassis, top cover frame features soft touch paint with lightweight aluminum insert anodized in HP's new "Space Silver" color with chemical etching. Backlight keyboard in full aluminum deck with magnesium bottom reinforcement, chemically strengthened glass touchpad, and updated system functions indicators. HP Spill Resistant Keyboard with Durakeys, touchpad buttons with Duracoat finish. Diamond cut process showcased around keyboard deck.
- Designed to pass Mil-Std-810G tests.
- Workstation-caliber NVIDIA® Quadro® discrete graphics: NVIDIA® Quadro® M620 (2GB GDDR5), NVIDIA® Quadro® M1200 (4GB GDDR5), AMD RadeonPro™ WX 4150 (4GB GDDR5), NVIDIA® Quadro® M2200 (4GB GDDR5); NVIDIA® Optimus or AMD Enduro™ technology.
- Intel Integrated graphics: Intel® HD Graphics 530 integrated on Core™ i7. Intel® HD Graphics P530 on Xeon® processors.
- ISV certified to provide fast and reliable performance with workstation applications, including manipulation of 3D textures.
- Choice of 7th generation Intel® Core™ i7 and i5 quad-core or Xeon® processors.
- Intel® Core™ i7 with vPro, Intel Core™ i5 with vPro technology or Intel Xeon® with vPro technology (optional)
- HP Performance Advisor for optimal configuration, compatibility and performance
- Up to four SODIMMs, for system memory up to 64 GB. ECC memory with Intel Xeon® processors.
- Supports multi-display, including up to four (4) displays without a docking solution, with hybrid graphics enabled. Supports up to six (6) displays with HP Zbook Dock with Thunderbolt™ 3 (sold separately), with hybrid graphics enabled.
- Two (2) Thunderbolt™ 3 ports (supporting DisplayPort 1.2, USB 3.1, PCIe Gen 3 devices) on the new USB-C™ connector, for high speed data/video/audio transfer support.
- Bang and Olufsen audio optimized for high fidelity audio with immersive surround sound with deep, rich bass and crystal clear dialog without distortion at high volume
- Long life battery solution: 9-cell (90 WHr)
- 2 discrete buttons with LED indicator for convenient one touch access – Wireless On/Off, Volume Mute
- Widescreen 15.6-inch diagonal anti-glare LED-backlit display:
FHD (1920x1080) standard viewing angle, FHD (1920x1080) ultrawide viewing angle, or UHD (3840x2160) ultrawide viewing angle with HP DreamColor Technology, or FHD Touch (1920x1080) ultrawide viewing angle.
- Wireless connectivity options:
 - Intel® Dual Band Wireless-AC 8265 802.11 AC/a/b/g/n (2x2) WiFi and Bluetooth® 4.2 combo adaptor (vPro) or Intel® Dual Band Wireless-AC 8265 802.11 AC/a/b/g/n (2x2) WiFi and Bluetooth® 4.2 combo (non-vPro)
 - Optional integrated wireless 3G or 4G (LTE) mobile broadband module support
- Three dedicated drive slots. (2) M.2 slots and (1) 2.5" drive bays.
- Security features including HP Client Security Manager, managed via single console.
- Low halogen
- HP BIOS technology, including HP Sure Start to identify and recover from unknown BIOS attacks.

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

Features

OPERATING SYSTEM

Preinstalled	Windows® 10 Pro 64 ¹
	Windows® 10 Home 64 ¹
	Windows® 10 Home Single Language 64 ¹
	FreeDOS 2.0
Supported	Windows® 10 Enterprise 64 ¹

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.microsoft.com>

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>

PROCESSOR*

Intel® Xeon®E3-1535M v6 with Intel® HD graphics P630 (3.10 GHz, 2400 MHz, 8MB L3 cache, 4 Cores, 45W)
Up to 4.20 GHz with Intel® Turbo Boost Technology

Intel® Xeon® E3-1505M v6 with Intel® HD graphics P630 (3.00 GHz, 2400 MHz, 8 MB L3 Cache, 4 Cores, 45W)
Up to 4.00 GHz with Intel® Turbo Boost Technology

Intel® Core™ i7-7820HQ with Intel® HD graphics 630 (2.90 GHz, 2400 MHz, 8 MB L3 Cache, 4 Cores, 45W)
Up to 3.90 GHz with Intel® Turbo Boost Technology

Intel® Core™ i7-7700HQ with Intel® HD graphics 630 (2.80 GHz, 2400 MHz, 6 MB L3 Cache, 4 Cores, 45W)
Up to 3.80 GHz with Intel® Turbo Boost Technology

Intel® Core™ i5-7440HQ with Intel® HD graphics 630 (2.80 GHz, 2400 MHz, 6 MB L3 Cache, 4 Cores, 45W)
Up to 3.80 GHz with Intel® Turbo Boost Technology

Intel® Core™ i5-7300HQ with Intel® HD graphics 630 (2.50 GHz, 2400 MHz, 6 MB L3 Cache, 4 Cores, 45W)
Up to 3.50 GHz with Intel® Turbo Boost Technology

*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 is not a measurement of higher performance.

Also note that the Intel® Turbo Boost is based on max GHz for a single core.

CHIPSET

Mobile Intel® CM238

Features

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® Centrino® 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.

GRAPHICS

Intel Integrated

Intel® HD graphics 630¹;
Intel® HD graphics P630¹;

NOTE 1: HD content required to view HD images.

NOTE 2: Available in hybrid graphics mode only with NVIDIA graphics

Discrete

AMD RadeonPro™ WX 4150 with 4 GB dedicated GDDR5 video memory
Microsoft DirectX 12 (Shader Model 5.0) and OpenGL 4.4 capable

NVIDIA® Quadro® M1200 with 4 GB dedicated GDDR5 video memory
Microsoft DirectX 12 (Shader Model 5.0) and OpenGL 4.4 capable

NVIDIA® Quadro® M2200 with 4 GB dedicated GDDR5 video memory
Microsoft DirectX 12 (Shader Model 5.0) and OpenGL 4.4 capable

NOTE: 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. AMD RadeonPro™ professional graphics support up to six independent displays when using an HP ZBook Dock with Thunderbolt™ 3 (sold separately) or DP 1.2 hubs with MST.

NVIDIA® Optimus Technology and AMD Enduro™ Technology supported

NOTE 1: Color management on UHD DreamColor panels is not supported while NVIDIA® Optimus Technology is activated.

Features

DisplayPort 1.2 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 DisplayPort 1.2 may be directly attached to the Thunderbolt™ port to achieve HBR2 with the use a dongle.
- DisplayPort monitors capable of supporting DP 1.2 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 1.2 MST feature ("daisy-chain" feature) is supported through Thunderbolt™ 3 port on Thunderbolt™ 3 enabled devices or DisplayPort 1.2 monitors (requires monitor with DisplayPort 1.2 MST capability) with the use of a dongle.
- Up to 2 streams (eight lanes) of DisplayPort 1.2 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 1.2 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 1.2, 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 ZBook Dock with Thunderbolt™ 3:

HP ZBook 15 with hybrid graphics and without the use of the ZBook dock supports up to a maximum of four independent displays. These four displays are the internal panel plus three external displays connected to the VGA and two of the three following ports: HDMI 1.4, Thunderbolt™ 3, Thunderbolt™ 3. HP ZBook 15 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, VGA, and two of the three following ports: HDMI, Thunderbolt™ 3, Thunderbolt™ 3.

With ZBook Dock with Thunderbolt™ 3:

The ZBook Dock with Thunderbolt™ 3 dock has Thunderbolt™ 3 port, VGA, and two DisplayPort 1.2. When used together with the HP ZBook 15 configuration with hybrid graphics, a maximum of 6 independent displays are supported. These six displays are internal panel, one external display connected to the system's VGA 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 15 configuration with Intel integrated graphics, a maximum of 3 independent displays are supported. Any three display combination of the system panel, system ports and ZBook Dock ports.

Without ZBook Dock with Thunderbolt™ 3 (using DP 1.2 MST)

Multi-stream Transport is a DP 1.2 feature that allows daisy chaining of DP 1.2 monitors that are Thunderbolt™ 3 enabled (requires built in support of DP 1.2 MST in monitor), or the use of DP 1.2 hubs (Thunderbolt™ 3 enabled) with MST to achieve 6 active displays without a docking station on configurations with hybrid graphics enabled.

* HP ZBook Dock with Thunderbolt™ 3 sold separately.

Features

DISPLAY

Internal

15.6" diagonal LED backlit FHD UWVA IPS eDP anti-glare + PSR (Panel Self Refresh) (1920 x 1080);
15.6" diagonal LED backlit FHD SVA eDP anti-glare (1920 x 1080);
15.6" diagonal LED UHD UWVA IPS anti-glare DreamColor (3840 x 2160)
15.6" diagonal Touch LED-backlit FHD UWVA IPS (1920 x 1080)

External

Up to 30-bit (2³⁰) per pixel "Deep Color"
(total of 1,073,741,824 color variations)

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

STORAGE AND DRIVES

(1) 2.5" Storage Bay Drives*

1 TB 5400 rpm SATA
500 GB 7200 rpm SATA
500 GB SATA SSHD (Hybrid Drive) (8 GB cache)
500 GB 7200 rpm SATA SED (Self Encrypting Drive)
500 GB 5400 rpm SATA FIPS 140-2 SED Drive
256GB SATA SSD

(2) M.2 SATA SED Solid State Drives*

256 GB SATA Self Encrypting Drive (SED)
512 GB SATA Self Encrypting Drive (SED)

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.

HP Z Turbo Drives (NVMe PCIe SSD)

256GB PCIe (NVMe) TLC Solid State Drive
256GB PCIe (NVMe) MLC Solid State Drive
512GB PCIe (NVMe) MLC Solid State Drive
512GB PCIe (NVMe) TLC Opal 2 Solid State Drive
1TB PCIe (NVMe) MLC Solid State Drive

*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.

Features

DRIVE CONTROLLERS

2.5" Storage Bays and M.2 Storage Bay (SATA):	SATA-3 or SATA-2 for HDD and SATA-3 for SSD
HP Z Turbo Drive:	PCIe NVMe SSD
RAID:	0, 1 supported*

NOTE: Raid 0, 1 supported only on SATA drives.

MEMORY

Standard

64 GB DDR4 1.2V ECC or Non-ECC SDRAM (With transfer rates up to 2400MT/s¹)
Four SODIMM slots supporting dual-channel memory
4 GB, 8GB and 16 GB SODIMMs (for Intel® Core™ Processors)
8GB and 16 GB ECC SODIMMs (for Intel® XEON® Processors)

Maximum

Upgradeable to 65536 MB with optional 16384 MB SODIMMs in all 4 slots

Dual-channel

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

NOTE 1: Above 2 SODIMM Memories the transfer rates will down from 2400 MT/s to 2133 MT/s

NOTE: Due to the non-industry standard nature of some third-party memory modules, we recommend HP branded memory to ensure compatibility. If you mix memory speeds, the system will perform at the lower memory speed. Maximum memory capacities assume Windows 64-bit operating systems. With Windows 32-bit operating systems, memory above 3GB may not all be available due to systems

NETWORKING/COMMUNICATIONS

Communications*

Intel® I219-LM Gigabit* Network Connection (vPro configurations)

Wireless

Support for a broad range of secure, integrated wireless LAN and wireless WAN options featuring support for the latest industry standards. Optional Broadband Wireless (WWAN) requires a Windows® operating system and is available in select countries as a standard, factory configurable feature only. Integrated Bluetooth® is also available (factory configurable only) and can be combined with any of the supported wireless LAN and wireless WAN options.

802.11 Wireless LAN options**

Intel® Dual Band Wireless-AC 8265 802.11 a/b/g/n/ac (2x2) WiFi and Bluetooth® 4.2 combo (vPro)
Intel® Dual Band Wireless-AC 8265 802.11 a/b/g/n/ac (2x2) WiFi and Bluetooth® 4.2 combo (non-vPro)

Wireless WAN - Mobile Broadband options***

HP It4120 Qualcomm® Snapdragon™ X5 LTE Mobile Broadband Module (optional)

Features

HP It4132, LTE/HSPA+ 4G Mobile Broadband Module (optional)

HP hs3210 HSPA+ Mobile Broadband Module (optional)

*The term "10/100/1000" or "Gigabit" Ethernet indicates compatibility with IEEE standard 802.3ab for Gigabit Ethernet, and does not connote actual operating speed of 1 Gb/s. For high-speed transmission, connection to a Gigabit Ethernet server and network infrastructure is required.

**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.

*** WWAN use requires separately purchased service contract. Check with service provider for coverage and availability in your area. Connection speeds will vary due to location, environment, network conditions, and other factors. 4G LTE not available on all products, and in all regions.

Features

AUDIO/MULTIMEDIA

Audio

Bang and Olufsen HD audio

Integrated stereo speakers

Integrated microphone (dual-microphone array when equipped with optional webcam)

Button for volume mute; function keys for volume up and down

Combo mic-in / stereo headphone-out jack

Webcam

Optional 720p HD webcam*

- 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.

KEYBOARDS/POINTING DEVICES/BUTTONS & FUNCTION KEYS

Keyboard

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

Touchpad with On/Off button, two-way scroll, gestures, three pick buttons

Pointstick with three additional pointstick buttons

Image sensor touchpad for enhanced performance and improved precision on scroll and gesture

Buttons and Function Keys

Separate launch buttons provide easy access to the following features: wireless on/off, volume mute. Function keys provide control of the following features: standby mode, external display, volume down, volume up, and display brightness.

Features

SOFTWARE AND SECURITY

Preinstalled Software with Windows® Operating System

BIOS

HP BIOSphere Gen3¹
HP Sure Start Gen3²
HP DriveLock | HP Automatic DriveLock
BIOS Update via Network
Master Boot Record Security
Power On Authentication
Secure Erase³
Absolute Persistence Module⁴
Pre-boot Authentication
HP LAN-WLAN Protection

Multi Media

Cyberlink Power MediaPlayer CMIT

Communication / Connectivity

HP Mobile Connect Pro⁵
Native Miracast Support⁶
HP MAC Address Manager (select models only)
HP Wireless Wakeup (select models only)
HP SureConnect

HP Value Add Software

HP 3D DriveGuard 6
HP ePrint Driver + JetAdvantage⁷
HP Hotkey Support
HP Recovery Manager
HP Jumpstart
HP Support Assistant¹²
HP Noise Cancellation Software
HP Performance Advisor
HP Remote Graphics Software
HP Velocity

Microsoft Products

Buy Office
Bing Search
Skype⁸

Manageability

HP Driver Packs⁹
HP SoftPaq Download Manager (SDM)
HP System Software Manager (SSM)⁹
HP BIOS Config Utility (BCU)⁹
HP Client Catalog⁹
HP Manageability Integration Kit for Microsoft SCCM¹⁰
HP Image Assistant
LANDESK Management¹¹

For more information on HP Client Management Solutions refer to: <http://www.hp.com/go/clientmanagement>.

Features

Client Security Software

- HP Client Security Suite Gen3¹³
- HP Security Manager (including Credential Manager and Password Manager)
- HP Fingerprint Sensor
- Power On Authentication
- Device Access Manager

Microsoft Defender¹⁴

HP WorkWise¹⁵

Standard

For Windows 10, Trusted Platform Module (TPM) 2.0 (Infineon SLB9670). Common Criteria EAL4+ Certified.

HP Fingerprint Reader

For more information on HP Client Security Software Suite, refer to <http://www.hp.com/go/clientsecurity>.

1. Requires Intel® 7th generation processors
2. Available on HP Elite products equipped with Intel® 7th generation processors.
3. For the methods outlined in the National Institute of Standards and Technology Special Publication 800-88.
4. Absolute agent is shipped turned off, and will be activated when customers activate a purchased subscription. Subscriptions can be purchased for terms ranging multiple years. Service is limited, check with Absolute for availability outside the U.S. The Absolute Recovery Guarantee is a limited warranty. Certain conditions apply. For full details visit: <http://www.absolute.com/company/legal/agreements/computrace-agreement>. Data Delete is an optional service provided by Absolute Software. If utilized, the Recovery Guarantee is null and void. In order to use the Data Delete service, customers must first sign a Pre-Authorization Agreement and either obtain a PIN or purchase one or more RSA SecurID tokens from Absolute Software.
5. HP Mobile Connect Pro is only available on preconfigured devices with WWAN. For geographic availability refer to <http://www.hp.com/go/mobileconnect>
6. Miracast is a wireless technology your PC can use to project your screen to TVs, projectors, and streaming media players that also support Miracast. You can use Miracast to share what you're doing on your PC and present a slide show. For more information: <http://windows.microsoft.com/en-us/windows-8/project-wireless-screen-miracast>
7. Requires an Internet connection to HP web-enabled printer and HP ePrint account registration (for a list of eligible printers, supported documents and image types and other HP ePrint details, see <http://www.hp.com/go/eprintcenter>). Requires optional broadband module. Broadband use requires separately purchased service contract. Check with service provider for coverage and availability in your area. Separately purchased data plans or usage fees may apply. Print times and connection speeds may vary.
8. Skype is not offered in China.
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. Subscription required.
12. Requires Windows and Internet Access
13. Requires Windows and Intel® 7th generation processors.
14. Opt in and internet connection required for updates
15. HP WorkWise smartphone app is available as a free download on the App Store and Google Play

Workstation ISV Certifications

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

HP Remote Graphics Software

Features

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>

Security

See Software section above.

Other Standard Security Features

Integrated Smart Card Reader

One-Step Logon

Security lock slot

Support for Intel® AT

Optional Security Features

HP Fingerprint Sensor (optional)

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.

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 reader and integrated Smart Card Reader help 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 9-cell Polymer Battery (90 WHr) *

Battery Life

Battery life up to 17 hours 30 minutes (with 90Whr battery, FHD panel, Z Turbo Drive, Intel graphics)**

Battery life up to 17 hours 26 minutes (with 90Whr battery, FHD panel, Z Turbo Drive; NVIDIA M1200, Hybrid graphics)**

System Standby Time

Up to TBD 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 for registration status by country. See HP's 3rd party option store for solar energy accessory 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.

WEIGHTS & DIMENSIONS

Weight

Starting at 5.7 lb. (2.60kg.)

Dimensions (w x d x h)

15.2 in x 10.4 in x 1.0 in

Features

386 mm x 264 mm x 26 mm

NOTE: Height varies depending upon where on the notebook the measurement is made. Weight varies by configuration and components. Weight includes Quad Core CPU, FHD, Intel® HD graphics, 8GBx1 SODIMM, HP Z Turbo Drive, wLAN/BT, FPR, 9-cell battery, no wWAN.

PORTS/SLOTS

Ports

Left side:

- (1) RJ-45 (Ethernet)
- (1) VGA
- (1) USB 3.0 Charging Port
- (1) Security lock slot

Right side:

- (1) HDMI 1.4
- (2) Thunderbolt™ 3* (Supporting DisplayPort 1.2, USB 3.1 Gen2, PCIe Gen 3 devices)
- (1) Stereo microphone in / headphone-out combo jack
- (1) Power Connector
- (2) USB 3.0

Thunderbolt™ 3

Thunderbolt™3 ports supports DisplayPort 1.2, 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,
- (1) Integrated Smart Card Reader (Compatible with ISO 7816 compliant Smart Cards PC/SC interface support)

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.

Technical Specifications – System Unit

SYSTEM UNIT

Stand-Alone Power Requirements (AC Power)	Nominal Operating Voltage	19.5 V	
	Average Operating Power	DreamColor Without DreamColor	25W (Windows® 10 64-bit) 16.8 W (Windows® 10 64-bit)
	Max Operating Power	< 150 W	
Temperature	Operating	32° to 95° F (0° to 35° C)	
	Non-operating	-4° to 140° F (-20° to 60° C)	
Relative Humidity	Operating	10% to 90%, non-condensing	
	Non-operating	5% to 95%, 101.6° F (38.7° C) maximum wet bulb temperature	
Shock	Operating	40 G, 2 ms, half-sine	
	Non-operating	200 G, 2 ms, half-sine	
Random Vibration	Operating	0.75 grms	
	Non-operating	1.50 grms	
Altitude (unpressurized)	Operating	-50 to 10,000 ft (-15.24 to 3,048 m)	
	Non-operating	-50 to 40,000 ft (-15.24 to 12,192 m)	
Industry Standard Certifications	UL	Yes	
	CSA	Yes	
	FCC Compliance	Yes	
	ENERGY STAR®	Select models*	
	EPEAT	Gold **	
	ICES	Planned	
	Australia / NZ A-Tick Compliance	Planned	
	CCC	Planned	
	Japan VCCI Compliance	Planned	
	KC	Planned	
BSMI	Planned		
CE Marking Compliance	Planned		
MIL STD 810G	Planned***		

* Configurations of the HP ZBook 15 G4 that are ENERGY STAR® qualified are identified as HP ZBook 15 G4 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.

*** 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. Damage under the MIL STD test conditions or any accidental damage requires an optional HP Accidental Damage Protection Care Pack. For accessibility information on HP products, please visit:

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

Technical Specifications - Displays

DISPLAYS

15.6" diagonal LED-backlit FHD UWVA IPS eDP anti-glare + Panel Self Refresh (PSR) (1920 x 1080)

Active Area (W x H)	13.54 x 7.59 in (34.4 x 19.4 cm)	
Dimensions (W x H)	15.6 in (39.6 cm)	
Weight	360 g (max)	
Surface Treatment	Anti-glare	
Contrast Ratio	600:1 (typical)	
Refresh Rate	60 Hz	
Brightness*	300 nit typical	
Pixel Resolution	Format	1920 x 1080 (FHD)
	Configuration	RGB Stripe
Backlight	LED	
PPI	141	
Viewing Angle	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-inch diagonal LED backlit FHD SVA eDP anti-glare + Panel Self Refresh (PSR) (1920 x 1080)

Active Area (W x H)	13.54 x 7.59 in (34.4 x 19.4 cm)	
Dimensions (W x H)	15.6 in (39.6 cm)	
Weight	380 g (max)	
Surface Treatment	Anti-glare	
Contrast Ratio	400:1 (typical)	
Refresh Rate	60 Hz	
Brightness*	300 nit typical	
Pixel Resolution	Format	1920 X 1800 (FHD)
	Configuration	RGB Stripe
Backlight	LED	
PPI	141	
Viewing Angle	45/45/35/25 (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-inch UHD UWVA IPS LED anti-glare + Panel Self Refresh (PSR) Dreamcolor (3840x2160)

Dimensions (W x H)	13.62 x 7.59 in (3.6 x 19.4 cm)	
Diagonal Size	15.6 in (39.6 cm)	
Weight	345 g (max)	
Surface Treatment	Anti-glare	
Contrast Ratio	1000:1 (min)	
Refresh Rate	60 Hz	
Brightness*	270 nit typical	
Pixel Resolution	Pitch	0.090 x 0.090 mm
	Format	3840x2160
	Configuration	RGB Stripe
Backlight	LED	

Technical Specifications - Displays

PPI	282
Viewing Angle	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-inch FHD TOUCH UWVA IPS LED (1920x1080)

Dimensions (W x H)	13.62 x 7.59 in (36 x 22.4 cm max)	
Diagonal Size	15.6 in (39.6 cm)	
Weight	345 g (max)	
Surface Treatment	Anti-glare	
Contrast Ratio	600:1 (typ)	
Refresh Rate	60 Hz	
Brightness*	300 nit typ	
Pixel Resolution	Format	1920 x 1080 (FHD)
	Configuration	RGB Stripe
Backlight	LED	
PPI	142	
Viewing Angle	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

1 TB 5400 rpm SATA Hard Drive	Drive Weight	0.21 lbs (94 g)- 0.21 lbs (95 g)
	Capacity	1 TB
	Height	0.28 in (7 mm)
	Width	2.75 in (69.85 mm)
	Interface	ATA-8, SATA 3.0
	Transfer Rate	Synchronous (maximum) 600 MB/s
	Seek Time (typical reads, including settling)	Single Track 2 ms Average 12 ms-13 ms Maximum 18 ms-22 ms
	Cache	Up to 32MB
	Rotational Speed	5400 rpm
	Logical Blocks	1,953,525,168
	Operating Temperature	32° to 140° F (0° to 60° C) [case temp]
	Features	ATA Security, S.M.A.R.T., NCQ, Ultra DMA

500 GB 7200 rpm SATA Hard Drive	Drive Weight	0.20 lbs (92 g) ~ 0.25 lbs (115 g)
	Capacity	500 GB
	Height	0.28 in (7 mm)
	Width	2.75 in (69.85mm)
	Interface	ATA-8, SATA 3.0
	Transfer Rate	Synchronous (maximum) 600 MB/s (Drive Capability)
	Seek Time (typical reads, including settling)	Single Track 1.5 ms ~ 2 ms Average 11 ms ~ 13 ms Maximum 18 ms ~ 22 ms
	Cache	Up To 32 MB
	Rotational Speed	7200 rpm
	Logical Blocks	976,773,168
	Operating Temperature	32° to 140° F (0° to 60° C) [top cover temp]
	Features	ATA Security, S.M.A.R.T., NCQ, Ultra DMA

Technical Specifications - Storage and Drives

500 GB Hybrid, 8 GB cache

Drive Weight	0.198 lbs (90 g) ~ 0.20 lbs (92 g)	
Capacity	500 GB	
Height	0.28 in (7 mm)	
Width	2.75 in (69.85 mm)	
Interface	ATA-8, SATA 3.0	
Transfer Rate	Synchronous (maximum)	600 MB/s
Seek Time (typical reads, including settling)	Single Track	1.5 ms ~ 2 ms
	Average	12 ms ~ 13 ms
	Maximum	22 ms ~ 32 ms
Cache	Up to 128MB	
Rotational Speed	5400 rpm	
Logical Blocks	976,773,168	
Operating Temperature	32° to 140° F (0° to 60° C) [case temp]	
Features	ATA Security, S.M.A.R.T., NCQ, Ultra DMA	

500 GB 7200 rpm SATA SED FIPS* 140-2 compliant Hard Drive

Drive Weight	0.21 lbs (95g)	
Capacity	500 GB	
Height	0.28 in (7 mm)	
Width	2.75 in (69.85 mm)	
Interface	ATA-8, SATA 3.0	
Transfer Rate	Synchronous (maximum)	600 MB/s (Drive Capability)
Seek Time (typical reads, including settling)	Single Track	1.5 ms
	Average	12 ms
	Maximum	18-22 ms
Cache	32 GB	
Rotational Speed	7200 rpm	
Logical Blocks	976,773,168	
Operating Temperature	32° to 140° F (0° to 60° C) [top cover temp]	
Features	ATA Security; TCG Opal 2.x, FIPS, S.M.A.R.T., NCQ, Ultra DMA	

* FIPS-certified, hardware-based AES-256 encryption image.

500 GB 7200 rpm SATA Self Encrypting Drive

Drive Weight	0.21 lbs (95g)	
Capacity	500 GB	
Height	0.28 in (7 mm)	
Width	2.75 in (69.85 mm)	
Interface	ATA-8, SATA 3.0	
Transfer Rate	Synchronous (maximum)	600 MB/s (Drive Capability)
Seek Time (typical reads, including settling)	Single Track	2 ms
	Average	12 ms
	Maximum	18-22 ms
Cache	32 MB	
Rotational Speed	7200 rpm	
Logical Blocks	976,773,168	
Operating Temperature	32° to 140° F (0° to 60° C) [case temp]	
Features	ATA Security, TCG Opal v1.00, S.M.A.R.T., NCQ, Ultra DMA	

Technical Specifications - Storage and Drives

256 GB M2 2280 SATA-3 Self-Encrypting Drive (Opal 2) TLC Solid State Drive	Drive Weight	0.02 lb (<10 g)	
	Capacity	256 GB	
	Height	0.14 in (3.58 mm)- 0.09 in (2.23 mm)	
	Width	0.87 in (22 mm)	
	Interface	ATA-8, SATA 3.0	
	Performance	Maximum Sequential Read	Maximum Sequential Write
		Up to 530 MB/s	UP to 515 MB/s
	Logical Blocks	500,118,192	
	Operating Temperature	32° to 158°F (0° to 70°C) [ambient temp]	
	Features	ATA Security; TCG Opal 2.0, DIPM; TRIM; DEVSLP	

512 GB M2 2280 SATA-3 Self-Encrypting Drive (Opal 2) TLC Solid State Drive	Drive Weight	0.022 lb (<10 g)	
	Capacity	1TB	
	Height	0.14 in (3.7 mm)	
	Width	0.87 in (22 mm)	
	Generation	XG4 NVMe	
	NAND Type	TLC	
	Form-Factor (I/O)	M.2 2280	
	Interface	PCIe GEN3X4	
	Performance	Maximum Sequential Read	Maximum Sequential Write
		Up to 2400MB/s	Up to 1500MB/s
Logical Blocks	2,000,409,264		
Operating Temperature	32° to 158°F (0° to 70°C) [ambient temp]		
Features	ATA Security, L1.2		

HP Z Turbo Drive 512 GB, M.2 NVMe MLC Solid State Drive	Drive Weight	0.022 lb. (10 g)	
	Capacity	512 GB	
	Height	0.14 in (3.7 mm)	
	Width	0.87 in (22 mm)	
	Generation	SM951 NVMe	
	NAND Type	MLC	
	Form-Factor (I/O)	M.2 2280	
	Interface	PCIe NVMe Gen3X4	
	Performance	Maximum Sequential Read	Maximum Sequential Write
		Up to 3000 MB/s	Up to 1500 MB/s
Logical Blocks	1,000,215,216		
Operating Temperature	32° to 158°F (0° to 70°C) [ambient temp]		
Features	ATA Security (Option); TRIM; L1.2		

Technical Specifications - Storage and Drives

HP Z Turbo Drive 256 GB, M.2 NVMe MLC Solid State Drive	Drive Weight	0.02 lb (10 g)	
	Capacity	256 GB	
	Height	0.09 in (2.23 mm)	
	Width	0.87 in (22 mm)	
	Generation	MLC	
	NAND Type	M.2 2280	
	Form-Factor (I/O)	PCIe NVMe Gen3X4	
	Performance	Maximum Sequential Read	Maximum Sequential Write
		Up to 3,100 MB/s	Up to 1,400 MB/s
	Logical Blocks	500,118,192	
Operating Temperature	32° to 158°F (0° to 70°C) [ambient temp]		
Features	ATA Security (Option);TRIM; L1.2		

HP Z Turbo Drive 256 GB, M.2 NVMe TLC Solid State Drive	Drive Weight	0.022 lb (<10 g)	
	Capacity	256 GB	
	Height	0.09 in (2.3 mm)	
	Width	0.87 in (22 mm)	
	Generation	SM951 NVMe	
	NAND Type	TLC	
	Form-Factor (I/O)	M.2 2280	
	Interface	PCIe GEN3X4	
	Performance	Maximum Sequential Read	Maximum Sequential Write
		Up to 2260MB/s	Up to 1260 MB/s
Logical Blocks	500,118,192		
Operating Temperature	32° to 158°F (0° to 70°C) [ambient temp]		
Features	ATA Security (Option),TRIM; L1.2		

HP Z Turbo Drive 512 GB, M.2 NVMe TLC Opal 2 Solid State Drive	Drive Weight	0.022 lb (<10 g)	
	Capacity	256 GB	
	Height	0.09 in (2.3 mm)	
	Width	0.87 in (22 mm)	
	Generation	SM951 NVMe	
	NAND Type	TLC	
	Form-Factor (I/O)	M.2 2280	
	Interface	PCIe GEN3X4	
	Performance	Maximum Sequential Read	Maximum Sequential Write
		Up to 2260MB/s	Up to 1260 MB/s
Logical Blocks	500,118,192		
Operating Temperature	32° to 158°F (0° to 70°C) [ambient temp]		
Features	ATA Security,TRIM; L1.2		

Technical Specifications - Storage and Drives

HP Z Turbo Drive 1 TB, M.2 NVMe MLC Solid State Drive	Drive Weight	0.022 lb (<10 g)	
	Capacity	256 GB	
	Height	0.09 in (2.3 mm)	
	Width	0.87 in (22 mm)	
	Generation	SM951 NVMe	
	NAND Type	MLC	
	Form-Factor (I/O)	M.2 2280	
	Interface	PCIe GEN3X4	
	Performance	Maximum Sequential Read	Maximum Sequential Write
		Up to 2260MB/s	Up to 1260 MB/s
	Logical Blocks	500,118,192	
	Operating Temperature	32° to 158°F (0° to 70°C) [ambient temp]	
Features	ATA Security, TRIM; L1.2		

*For hard 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.

Technical Specifications - Security

SECURITY

HP Fingerprint Sensor	Mobile Voltage Operation	3.0V-3.6V Single Supply
	Operating Temperature	14° - 167°F (-10° - 75°C)
	Current consumption image	36mA
	Low latency wait for finger	950 uA
	Capture rate	3000 lines/sec
	ESD Resistance	IEC 6100-4-2 4B (+/-15KV)
	Detection Matrix	200*1 (plus another secondary line); 508 dpi, sensor area 12*3 mm

Technical Specifications – Networking

NETWORKING/COMMUNICATION

Intel® I219-LM Gigabit Network Connection (vPro configurations)

Ethernet Features

10 Mbit/s operation (10BASE-T; IEEE 802.3i; IEEE 802.3 clauses 13-14)
 100 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 802.3. Clauses 40)
 Auto-Negotiation (Automatic Speed Selection)
 Full Duplex Operation at all Speeds, Half Duplex operation at 10 and 100 Mbit/s
 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)
 Jumbo Frame 9K
 Auto MDI/MDIX Crossover cable detection

Power Management Performance Features

ACPI compliant - multiple power modes
 Energy Detect Low Power Mode(Green Ethernet)
 TCP/IP/UDP Checksum Offload (configurable)
 Protocol Offload(ARP & NS)
 Large send offload and Giant send offload
 Receiving Side Scaling
 MACSec Offload (802.3ae)

Manageability

Intel® vPro
 iSCSI Boot
 RSS is kernel based support (e.g. in Win Server 2013)
 Ultra Low Power at cable disconnect (<1mW) enables platform support for connected standby.
 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

Interface

PCI Express 1.1 x1 to fully support ASPM L0s/L1 and CLKREQ.
NOTE: Intel® I219-LM Gigabit interface is not PCIe compliant. It operates at half of PCIe specification V1.1 (2.5GT/S) speed.

NIC Device Driver Name

Intel® Ethernet Network Connection I219-LM

Technical Specifications – Networking

Intel® I219-V Gigabit Network Connection (Non-vPro configurations)

Ethernet Features

10 Mbit/s operation (10BASE-T; IEEE 802.3i; IEEE 802.3 clauses 13-14)
 100 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 802.3 Clauses 40)
 Auto-Negotiation (Automatic Speed Selection)
 Full Duplex Operation at all Speeds, Half Duplex operation at 10 and 100 Mbit/s
 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)
 Jumbo Frame 9K
 Auto MDI/MDIX Crossover cable detection

Power Management
 ACPI compliant - multiple power modes
 Energy Detect Low Power Mode(Green Ethernet)

Performance Features
 TCP/IP/UDP Checksum Offload (configurable)
 Protocol Offload(ARP & NS)
 Large send offload and Giant send offload
 Receiving Side Scaling
 MACSec Offload (802.3ae)
 Intel Non-vPro
 iSCSI Boot

Manageability
 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

Interface
 PCI Express 1.1 x1 to fully support ASPM L0s/L1 and CLKREQ.
 NOTE: Intel 82579 PCIe interface is not PCIe compliant. It operates at half of PCIe specification V1.1 (2.5GT/S) speed.

NIC Device Driver Name
 Intel 82579LM/82579V Ethernet Network Connection

Technical Specifications – Networking

HP It4132 LTE/HSPA+ 4G Mobile Broadband Module

Technology/Operating bands	LTE: 2100 (Band 1), 1900 (Band 2), 1800 (Band 3) MHz, 850 (Band 5), 2600 (Band 7), 900 (Band 8) MHz, 800 (Band 20), 700 (Band 28) MHz. HSPA+: 2100 (Band 1), 1900 (Band 2), 850 (Band 5), 900 (Band 8) MHz E-GPRS: 1900 (Band 2), 1800 (Band 3), 850 (Band 5), 900 (Band 8) MHz
Wireless protocol standards	3GPP Release 10 LTE Specification CAT.4, 20MHz BW WCDMA R99, 3GPP Release 5, 6, 7 and 8 UMTS Specification E-GPRS: Class B, Multi-slot class 12, coding schemes CS1 - CS4 and MSC1 - MSC9
GPS	Standalone, A-GPS (MS-B and LTO)
GPS bands	1575.42 MHz ± 1.023 MHz, GLONASS 1596-1607MHz
Maximum data rates	LTE: 150 Mbps (Download), 50 Mbps (Upload) DC-HSPA+: 42 Mbps (Download), 5.76 Mbps (Upload) HSPA+: 21Mbps (Download), 5.76 Mbps (Upload) EDGE: 236.8 kbps (Download), 236.8 kbps (Upload) GPRS: 85.6 kbps(Download), 85.6 kbps (Upload)
Maximum output power	LTE: 23 dBm HSPA+: 23.5 dBm E-GPRS 1900/1800: 26 dBm E-GPRS 900/850: 27 dBm GPRS 1900/1800: 29.5 dBm GPRS 900/850: 32.5 dBm
Maximum power consumption	LTE: 1,200 mA (peak); 900 mA (average) HSPA+: 1,100 mA (peak); 800 mA (average) E-GPRS: 2,600 mA (peak); 500 mA (average)
Form Factor	M.2, 3042-S3 Key B
Weight	6 g
Dimensions (Length x Width x Thickness)	42 x 30 x 2.3 mm

* Mobile Broadband is an optional feature. Connection requires wireless data service contract, network support, and is not available in all areas. Contact service provider to determine the coverage area and availability. Connection speeds will vary due to location, environment, network conditions, and other factors. 4G LTE not available on all products or in all countries.

HP hs3210 HSPA+ Mobile Broadband Module*

Technology/Operating bands	HSPA+: 2100 (Band1), 1900 (Band 2), 850 (Band 5), 900 (Band 8) MHz E-GPRS: 1900 (Band 2), 1800 (Band 3), 850 MHz (Band 5), 900 (Band 8) MHz
Wireless protocol standards	WCDMA R99, 3GPP Release 5, 6 and 7 UMTS Specification E-GPRS: Class B, Multi-slot class 33, coding schemes CS1 - CS4 and MSC1 - MSC9
Maximum data rates	HSPA+: 21.6 Mbps (Download), 5.76 Mbps (Upload) E-GPRS: 296 kbps (Download), 236.8 kbps (Upload) GPRS: 107 kbps (Download), 85.6 kbps (Upload)
Maximum output power	HSPA+: 24 dBm E-GPRS 1800/1900: 26 dBm E-GPRS 850/900: 27 dBm

Technical Specifications – Networking

	GPRS 1800/1900: 30 dBm GPRS 850/900: 33 dBm
Maximum power consumption	HSPA+: 1,100 mA (peak); 800 mA (average) E-GPRS: 2,800 mA (peak); 700 mA (average)
Form Factor	M.2, 2242-S3 Key B
Weight	6 g
Dimensions (Length x Width x Thickness)	1.65 x 8.66 x 0.09 in (42 x 22 x 2.38 mm)

* Mobile Broadband is an optional feature. Connection requires wireless data service contract, network support, and is not available in all areas. Contact service provider to determine the coverage area and availability. Connection speeds will vary due to location, environment, network conditions, and other factors.

HP It4120 Qualcomm® Snapdragon™ X5 LTE Mobile Broadband Module

Technology/Operating bands	LTE: 2100 (Band 1), 1900 (Band 2), 1800 (Band 3), 1700/2100 (Band 4), 850 (Band 5), 2600 (Band 7), 900 (Band 8), 700 (Band 12 lower), 700 (Band 13 upper), 700 (Band 17 lower), 800 (Band 20), 700 (Band 28). HSPA+: 2100 (Band 1), 1900 (Band 2), 1700/2100 (Band 4), 850 (Band 5), 900 (Band 8) MHz EV-DO: 850 (BC0), 1900 (BC1) MHz (Only work with Verizon network) E-GPRS: 1900 (Band 2), 1800 (Band 3), 850 (Band 5), 900 (Band 8) MHz
Wireless protocol standards	3GPP Release 10 LTE Specification CAT.4, 20MHz BW WCDMA R99, 3GPP Release 5, 6, 7 and 8 UMTS Specification 1xEVDO Release 0, A and B. E-GPRS: Class B, Multi-slot class 12, coding schemes CS1 - CS4 and MSC1 - MSC9
GPS	Standalone, A-GPS (MS-A, MS-B and XTRA)
GPS bands	1575.42 MHz ± 1.023 MHz, GLONASS 1596-1607MHz
Maximum data rates	LTE: 150 Mbps (Download), 50 Mbps (Upload) DC-HSPA+: 42 Mbps (Download), 5.76 Mbps (Upload) HSPA+: 21Mbps (Download), 5.76 Mbps (Upload) CDMA 1xRTT: 153.6 kbps (Download), 153.6 kbps (Upload) EVDO Rel.A: 3.1 Mbps (Download), 1.8 Mbps (Upload) EVDO Rel.B: 14.7 Mbps (Download), 5.4Mbps (Upload) EDGE: 236.8 kbps (Download), 236.8 kbps (Upload) GPRS: 85.6 kbps(Download), 85.6 kbps (Upload)
Maximum output power	LTE: 23 dBm HSPA+: 23.5 dBm 1xRTT/EVDO: 24dBm E-GPRS 1900/1800: 26 dBm E-GPRS 900/850: 27 dBm GPRS 1900/1800: 29.5 dBm GPRS 900/850: 32.5 dBm
Maximum power consumption	LTE: 1,200 mA (peak); 900 mA (average) HSPA+: 1,100 mA (peak); 800 mA (average) 1xRTT/EVDO: 1,000 mA (peak); 700 mA (average) E-GPRS: 2,800 mA (peak); 500 mA (average)
Form Factor	M.2, 3042-S3 Key B
Weight	6.2 g

Technical Specifications – Networking

Dimensions 42 x 30 x 2.3 mm
(Length x Width x Thickness)

Intel® Dual Band Wireless-AC 8265 802.11 AC/a/b/g/n (2x2) WiFi + Bluetooth® 4.2 Combo Adaptor* (vPro)

Wireless LAN Standards

IEEE 802.11a
IEEE 802.11b
IEEE 802.11g
IEEE 802.11n
IEEE 802.11n

Interoperability

Wi-Fi certified

Frequency Band

802.11b/g/n

2.402 - 2.482 GHz

Note: 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

802.11a

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

Note: Indonesia only supports 5.725 - 5.825 GHz (CH149 - CH161)

Data Rates

- 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)

Modulation

Direct Sequence Spread Spectrum
CCK, BPSK, QPSK, 16-QAM, 64-QAM, 256-QAM

Security¹

- IEEE and Wi-Fi 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

Network Architecture Models

Ad-hoc (Peer to Peer)
Infrastructure (Access Point Required)

Roaming

IEEE 802.11 compliant roaming between band Access Points

Output Power²

- 802.11b : +16dBm minimum
- 802.11g : +14dBm minimum
- 802.11a : +14dBm minimum
- 802.11n HT20(2.4GHz) : +13dBm minimum
- 802.11n HT40(2.4GHz) : +13dBm minimum

Technical Specifications – Networking

	<ul style="list-style-type: none"> 802.11n HT20(5GHz) : +12dBm minimum 802.11n HT40(5GHz) : +12dBm minimum
Power Consumption	Transmit: 2.0 Watts (max) Receive: 1.6 Watts (max) Idle mode (PSP): 180 mW (WLAN Associated) Idle mode: 50 mW (WLAN unassociated) Connect Standby: 10mW (WLAN + BT) Radio disabled: 5 mW
Power Management	ACPI and PCI Express compliant power management 802.11 compliant power saving mode
Receiver Sensitivity³	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
Antenna Type	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 and Bluetooth communications
Form Factor	PCI-Express M.2 MiniCard
Dimensions	Type 2230 : 2.3 x 22.0 x 30.0 mm Or Type 1630 : 2.3 x 16.0 x 30.0 mm
Weight	Type 2230 : 2.8g Or Type 1630 : 2g
Operating Voltage	3.3v +/- 9%
Temperature	Operating 14° to 158° F (-10° to 70° C) Non-operating -40° to 176° F (-40° to 80° C)
Humidity	Operating 10% to 90% (non-condensing) Non-operating 5% to 95% (non-condensing)
Altitude	Operating Non-operating 0 to 10,000 ft (3,048 m) 0 to 50,000 ft (15,240 m)
LED Activity	LED Amber – Radio OFF; LED White – Radio ON

Technical Specifications – Networking

HP Integrated Module with Bluetooth® 4.2 Wireless Technology	Bluetooth® Specification	4.2 Compliant												
	Frequency Band	2402 to 2480 MHz												
	Number of Available Channels	Legacy: 0~79 (1 MHz/CH) BLE: 0~39 (2 MHz/CH)												
	Data Rates and Throughput	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)												
	Transmit Power	The Bluetooth component shall operate as a Class II Bluetooth device with a maximum transmit power of +4 dBm for BR and EDR												
	Receiver Sensitivity	<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>$\pi/4$-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												
	Power Consumption	Peak (Tx) 330 mW Peak (Rx) 230 mW Selective Suspend 17 mW												
	Antenna	Internally integrated within module												
	Range	Legacy Up to 33 ft (10 m) BLE Up to 99 ft (30 m)												
	Electrical Interface	USB 2.0 compliant												
	Bluetooth® Software Supported	Microsoft Windows Bluetooth Software												
	Link Topology	Point to Point, Multipoint Pico Nets up to 7 slaves												
	Security	Full support of Bluetooth Security Provisions												
	Power Management	Microsoft Windows ACPI, and USB Bus Support												
	Certifications	Self-configurable to optimize power conservation in all operating modes, including Standby, Hold, Park, and Sniff												
	Security	All necessary regulatory approvals for supported countries, including: FCC (47 CFR) Part 15C, Section 15.247 & 15.249												
	Power management certifications	ETS 300 328, ETS 300 826 Low Voltage Directive IEC950 UL, CSA, and CE Mark												
	Certifications	Serial Port Profile (SPP)1												
	Bluetooth® Profiles Supported	Service Discovery Application Profile (SDAP) Dial-Up Networking (DUN)1,2 Generic Object Exchange Profile (GOEP)1,2 Object Push Profile (OPP)1,2 Hard Copy Cable Replacement (HCRP)1,2 Personal Area Networking Profile (PAN)1,2 Human Interface Device Profile (HID)1,2 Hands Free Profile (HFP) Advanced Audio Distribution Profile (A2DP) Audio Video Remote Control Profile (AVRCP)												

Technical Specifications – Networking

Bluetooth® V4.2 support feature

V4.2: ESR8 compliant, LE Secure Connection – Basic.

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 (CCK modulation) and a packet error rate of 10% for 802.11a/g (OFDM modulation).

WLAN supplier's client utility is required for Cisco Compatible Extensions support with Microsoft Windows XP. WLAN may also be compatible with certain third-party software supplicants. WLAN supplier IHV extensions required for Cisco Compatible Extensions support for Microsoft Windows Vista.

Intel® Dual Band Wireless-AC 8265 802.11 AC/a/b/g/n (2x2) WiFi + Bluetooth® 4.2 Combo Adaptor* (non-vPro)

Wireless LAN Standards

IEEE 802.11a
 IEEE 802.11b
 IEEE 802.11g
 IEEE 802.11n
 IEEE 802.11ac

Interoperability

Wi-Fi certified

Frequency Band

802.11b/g/n

2.402 - 2.482 GHz

Note: 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

802.11a

- 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

Note: Indonesia only supports 5.725 - 5.825 GHz (CH149 - CH161)

Antenna Structure

2 transmit; 2 receive (2x2)

Data Rates

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: card will support rates for NSS=1 and NSS=2 for RX and TX for 20 and 40 MHz channels. Short and long guard interval shall be supported.
 802.11ac : MCS0 ~ MCS9, (1SS, and 2SS) (20MHz, 40MHz, and 80MHz)

Modulation

Direct Sequence Spread Spectrum
 BPSK, QPSK, CCK, 16-QAM, 64-QAM, 256-QAM

Security¹

- IEEE and Wi-Fi compliant 64 / 128 bit WEP encryption for a/b/g mode only
- AES-CCMP: 128 bit in hardware
- 802.1x authentication

Technical Specifications – Networking

	<ul style="list-style-type: none"> • 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
Network Architecture Models	Ad-hoc (Peer to Peer) Infrastructure (Access Point Required)
Roaming	IEEE 802.11 compliant roaming between access points
Output Power²	<ul style="list-style-type: none"> • 802.11b : +16dBm minimum • 802.11g : +14dBm minimum • 802.11a : +14dBm minimum • 802.11n HT20(2.4GHz) : +13dBm minimum • 802.11n HT40(2.4GHz) : +13dBm minimum • 802.11n HT20(5GHz) : +12dBm minimum • 802.11n HT40(5GHz) : +12dBm minimum • 802.11ac 80MHz(5GHz) : +11dBm minimum
Power Consumption	Transmit: 2.0 W (max) Receive: 1.6 W (max) Idle mode (PSP): 180 mW (WLAN Associated) Idle mode: 60 mW (WLAN unassociated) Radio disabled: 30 mW
Power Management	ACPI and PCI Express compliant power management 802.11 compliant power saving mode
Receiver Sensitivity³	<p>802.11g:-90 dBm (6 Mbps), -89 dBm (9 Mbps), -87 dBm (12 Mbps), -85 dBm (18 Mbps), -82 dBm (24 Mbps), -79 dBm (36 Mbps), -76 dBm (48 Mbps), -74 dBm (54 Mbps)</p> <p>802.11b:-95 dBm (1 Mbps), -93 dBm (2 Mbps), -91 dBm (5.5 Mbps), -88 dBm (11 Mbps)</p> <p>802.11g:-90 dBm (6 Mbps), -89 dBm (9 Mbps), -87 dBm (12 Mbps), -85 dBm (18 Mbps), -82 dBm (24 Mbps), -79 dBm (36 Mbps), -76 dBm (48 Mbps), -74 dBm (54 Mbps)</p> <p>802.11n:-69 dBm (150 Mbps), -66 dBm (300 Mbps)</p>
Antenna type	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
Form Factor	PCI-Express Half-MiniCard
Dimensions	0.134 x 1.06 x 1.18 in (3.4 x 26.8 x 30 mm)
Weight	3.1g
Operating Voltage	3.3v +/- 9%
Temperature	Operating 14° to 158° F (-10° to 70° C) Non-operating -40° to 176° F (-40° to 80° C)
Humidity	Operating 10% to 90% (non-condensing) Non-operating 5% to 95% (non-condensing)

Technical Specifications – Networking

Altitude	Operating	0 to 10,000 ft. (3,048 m)
	Non-operating	0 to 50,000 ft. (15,240 m)
LED Activity	LED Amber - Radio OFF; LED White - Radio ON	
	<ol style="list-style-type: none"> 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). 	
HP Integrated Module with Bluetooth® 4.2 Wireless Technology		
Bluetooth Specification	4.0+EDR Compliant	
Frequency Band	2402 to 2480 MHz	
Number of Available Channels	79 (1 MHz) available channels	
Data Rates and Throughput	3 Mbps data rate; throughput up to 2.17 Mbps	
	Synchronous Connection Oriented links up to 3, 64 kbps, voice channels	
	Asynchronous Connection Less links 2178.1 kbps/177.1 kbps asymmetric or 1306.9 kbps symmetric	
Transmit Power	The Bluetooth component shall operate as a Class II Bluetooth device with a maximum transmit power of +4 dBm for BR and EDR	
Receiver Sensitivity	Better than -20 dBm at 0.1 % raw bit error rate	
Power Consumption	Peak (Tx) 330 mW Peak (Rx) 230 mW Selective Suspend 17 mW	
Antenna	Internally integrated within module	
Range	Up to 33 ft. (10 m)	
Electrical Interface	USB 2.0 compliant	
	Microsoft Windows Plug and Play compliant	
Bluetooth® Software Supported	Broadcom Bluetooth for Windows Microsoft Windows Bluetooth Software	
Link Topology	Point to Point, Multipoint Pico Nets up to 7 slaves	
Security	Full support of Bluetooth Security Provisions	
Power Management	Microsoft Windows ACPI, and USB Bus Support	
	Self-configurable to optimize power conservation in all operating modes, including Standby, Hold, Park, and Sniff	
Certifications	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	
Bluetooth® Profiles Supported	Serial Port Profile (SPP) ¹ Service Discovery Application Profile (SDAP) Dial-Up Networking (DUN) ^{1,2} Generic Object Exchange Profile (GOEP) ^{1,2} Object Push Profile (OPP) ^{1,2} File Transfer Profile (FTP) Synchronization Profile (SYNC) Hard Copy Cable Replacement (HCRP) ^{1,2} Personal Area Networking Profile (PAN) ^{1,2}	

Technical Specifications – Networking

- Human Interface Device Profile (HID)^{1,2}
- FAX Profile (FAX)
- Basic Imaging Profile (BIP)²
- Headset Profile (HSP)
- Hands Free Profile (HFP)
- Advanced Audio Distribution Profile (A2DP)

1. Indicates the profile is supported by Microsoft Windows XP SP2

2. Indicates the profile is part of Windows Vista

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

Intel® Dual Band Wireless-AC 3168 802.11 ac (1x1) WiFi and Bluetooth® 4.2 Combo Adapter (non-vPro)

Wireless LAN Standards

- IEEE 802.11a
- IEEE 802.11b
- IEEE 802.11g
- IEEE 802.11n
- IEEE 802.11ac

Interoperability

Wi-Fi certified

Frequency Band

- 802.11b/g/n
 - 2.402 – 2.482 GHz

Note: 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.

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

Note: Indonesia only supports 5.725 - 5.825 GHz (CH149 - CH161)

Data Rates

- 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 ~ MCS7, (1SS) (20MHz, 40MHz, and 80MHz)

Modulation

Direct Sequence Spread Spectrum
BPSK, QPSK, CCK, 16-QAM, 64-QAM, 256-QAM

Security¹

- IEEE and Wi-Fi 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

Technical Specifications – Networking

Network Architecture Models	Ad-hoc (Peer to Peer) Infrastructure (Access Point Required)
Roaming	IEEE 802.11 compliant roaming between access points
Output Power²	<ul style="list-style-type: none"> • 802.11b : +16dBm minimum • 802.11g : +14dBm minimum • 802.11a : +14dBm minimum • 802.11n HT20(2.4GHz) : +13dBm minimum • 802.11n HT40(2.4GHz) : +13dBm minimum • 802.11n HT20(5GHz) : +12dBm minimum • 802.11n HT40(5GHz) : +12dBm minimum • 802.11ac 80MHz(5GHz) : +11dBm minimum
Power Consumption	Transmit: 2.0 W (max) Receive: 1.6 W (max) Idle mode (PSP): 180 mW (WLAN Associated) Idle mode: 60 mW (WLAN unassociated) Radio disabled: 30 mW
Power Management	ACPI and PCI Express compliant power management 802.11 compliant power saving mode
Receiver Sensitivity³	802.11b, 1Mbps : -94dBm maximum 802.11b, 11Mbps : -86dBm maximum 802.11g, 6Mbps : -88dBm maximum 802.11g, 54Mbps : -74dBm maximum 802.11a, 6Mbps : -86dBm maximum 802.11a, 54Mbps : -72dBm 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
Antenna type	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
Form Factor	PCI-Express M.2 MiniCard
Dimensions	Type 2230 : 2.3 x 22.0 x 30.0 mm Or Type 1630 : 2.3 x 16.0 x 30.0 mm
Weight	Type 2230 : 2.8g Or Type 1630 : 2g
Operating Voltage	3.3v +/- 9%
Temperature	Operating 14° to 158° F (-10° to 70° C) Non-operating 40° to 176° F (-40° to 80° C)
Humidity	Operating 10% to 90% (non-condensing) Non-operating 5% to 95% (non-condensing)
Altitude	Operating 0 to 10,000 ft (3,048 m) Non-operating 0 to 50,000 ft (15,240 m)

Near Field Communications (NFC)

Controller	HP Module with NXP NFC Controller NPC100
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Technical Specifications – Networking

Supports	<ul style="list-style-type: none"> • 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
Chipset	NPC100
System interface	I2C
NFC RF standards	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
NFC Forum Support Tag	Type 1, Type 2, Type3 and Type 4, NFCIP-1 and NFCIP-2
Reader	(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
Card Emulation	(PICC-VICC)
Mode¹	ISO/IEC 14443 A ISO/IEC 14443 B and B' MIFARE FeliCa
Frequency	13.56 MHz
NFC Modes Supported	Reader/Writer, Peer-to-Peer
Raw RF Data Rates	106, 212, 424, 848 kbps
Operating temperature	0°C to 70°C
Storage temperature	-20°C to 125°C
Humidity	10-90% operating 5-95% non-operating
Supply Operating voltage	2.97 to 5.5 Volts
I/O Voltage	1.8V or 3.3V
Power Consumption	Booster enable, VBAT= 3.3V, VCC_BOOST = 5V) Typical ² Polling 7.3 mA Detected Test Tag Type 1 Total Mode Power 283.8 mA Net Module 236.8 mA Detected Test Tag Type Consumption, 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
Antenna connector	0.5mm pitch, 7 connector FPC. Antenna matching is external to module.
Notes	<ol style="list-style-type: none"> 1. With application or UICC support 2. Actual Power Consumption is dependent on NFC antenna and matching circuit and on the particular polling sequence and period configured.

Technical Specifications - Audio and Multimedia

AUDIO/MULTIMEDIA – BANG & OLUFSEN

Hardware	Implementation	Conexant CX7501
	Function Key	Volume up, volume down, and mute
	Volume Controls	
	Full Duplex	Yes
	Microphone In	Stereo
	Headphone/Line Out	Stereo
	Integrated Microphone	Yes, dual digital microphone array when equipped with optional webcam
Audio Output Quality	Frequency Response	20 Hz - 20 kHz
	Signal to Noise Ratio	106dB (DAC), 102dB (ADC)
	Total Harmonic Distortion	91dB THD+n on LineOut/HP (0.003%)
	Noise Floor	-110 dB
	Play Sampling Rate(s)	Up to 192kHz
	Record Sampling Rate(s)	Up to 96kHz
	DAC	16, 20 or 24-bit
	ADC	16, 20 or 24-bit
Internal Stereo Speaker	Power Rating	2 Watts
	Impedance	4 ohms

Technical Specifications - Power

POWER

HP 150W Slim Smart AC Adapter	Dimensions	6.02 x 2.60 x .87 in (153 x 66 x 22 mm)	
	Weight	0.70 lbs (320 g)	
	Input	Input	100 to 240 VAC
		Input Efficiency	88% min at 115 VAC
	Output	Input frequency range	47 to 63 Hz
		Input AC current	2.9 A at 90 VAC, 1.45 A at 180 VAC
		Output power	150W
		DC output	19.5V
		Hold-up time	5 msec at 115 VAC input
	Connector	Output current limit	<16A, Over voltage protection- 29V max automatic shutdown
		Connector	3 pin/grounded, mates with interchangeable cords
	Environmental Design	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%	
EMI and Safety Certifications	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.		

HP Long Life 9-cell Polymer Battery (90 WHr)	Dimensions (H x W x L)	0.47 x 4.33 x 10.2 in (1.2 x 11 x 26cm)	
	Weight (max)	1.12lb (420g)	
	Cells/Type	9-cell; Polymer	
	Energy	Voltage	11.4V
		Amp-hour capacity	7.905Ah
		Watt-hour capacity	90Wh
	Temperature	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)
	Battery Re-Charge Time	System in OFF or Standby Mode	3 hours
		System ON	3 to 5 hours
Fuel Gauge LED	No		
Warranty*	3 year		
Compatible with optional Travel Battery	N/A		

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

Technical Specifications - Environmental Data

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 _{WAd} , bels)	Sound Pressure (L _{pAm} , 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:

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

Technical Specifications - Environmental Data

- 1 Smart Card reader
- 4 SODIMM memory slots
- 1 HDMI 1.4 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: Lithium

Battery size: 6-cell high capacity Lithium-Ion battery (optional 8 cell available)

Battery type:

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
- 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

External:	PAPER/Corrugated	383 g
Internal:	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

Technical Specifications - Environmental Data

- Mercuric Oxide Batteries
- 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>

Technical Specifications - Environmental Data

COUNTRY OF ORIGIN

China

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

Type	Description	Part #	
Memory	HP 4GB DDR4-2400 SODIMM (Core processors only)	Z4Y84AA	
	HP 8GB DDR4-2400 SODIMM (Core processors only)	Z4Y85AA	
	HP 16GB DDR4-2400 SODIMM (Core processors only)	Z4Y86AA	
	HP 8GB DDR4-2133 EEC SODIMM (Xeon® processors only)	V1D58AA	
	HP 16GB DDR4-2133 EEC SODIMM (Xeon® processors only)	V1D59AA	
Cases	HP Executive 15.6 Black Top Load	P6N18AA	
	HP Business Case (up to 15.6")	H5M92AA	
Docking	HP ZBook Dock with Thunderbolt™ 3	P5Q58AA	
	HP Executive Travel Hub	T0K29AA	
	HP Travel Hub	T0K30AA	
	HP 3005pr USB 3.0 Port Replicator w/ USB-C Adapter	Y4H06AA	
	HP USB-Type C™ Elite Dock	X7W54AA	
Input/Output - Mice	HP Comfort Grip Wireless Mouse	H2L63AA	
	HP 3-Button Laser Mouse	H4B81AA#xxx	
	HP Ultra Mobile Wireless Mouse	H6F25AA#xxx	
	HP X4000 Bluetooth® Mouse	H3T50AA#xxx	
	HP Slim Bluetooth® Mouse	F3J92AA#xxx	
	HP Ultrathin Wireless Mouse	L9V78AA	
	HP Wireless (Link-5) Keyboard	T6U20AA	
	HP Slim Wireless Keyboard and Mouse	T6L04AA#xxx	
	HP Slim USB Keyboard and Mouse	T6T83AA	
	HP Stereo 3.5mm Headset	T1A66AA	
	HP Stereo USB Headset	T1A67AA	
		HP 150W Slim Smart AC Adapter (4.5mm)	W2F74AA
Adapters	HP Wireless display adapter	J1V25AA#xxx	
	HP USB-C to VGA Adapter	N9K76AA	
	HP USB-C to DisplayPort Adapter	N9K78AA	
	HDMI to DVI adapter	F5A28AA	
	USB-C to TB1/TB2	Z4P20AA	
Collaboration	HP Conferencing Keyboard	K8P74AA#xxx	
	HP UC Speaker Phone	K7V16AA	
	HP UC Wired Headset	K7V17AA	
	HP UC Wireless Mono Headset	W3K08AA	
	HP UC Wireless Duo Headset	W3K09AA	
		HP External USB Optical Drive	F2B56AA

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

Storage - External	HP 500GB 7200rpm HDD	F3B97AA
Storage	HP 256GB TLC PCI-e 3x4 NVMe SSD (2280)	1FU87AA
	HP 256GB M2 PCIe NVME SSD (2280)	V3K66AA
	HP 512GB M2 PCIe NVME SSD (2280)	V3K67AA
Security	HP UltraSlim Keyed Cable Lock	H4D73AA
	HP Dual Head Cable Lock (Non-Master Key)	T1A64AA
	HP Dual Head Cable Lock (Master Key)	T1A65AA
	HP 15.6" Notebook PC Privacy Filter	J7H71AA
	HP Essential Combination Lock	TOY16AA
	HP Combination Lock	TOY15AA
	HP Keyed Cable lock	TOY14AA
	HP Keyed Cable Lock 10mm	T1A62AA

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

Summary of Changes

Date of change:	Version History:		Description of change:
April 21, 2017	From v1 to v2	Removed	Integrated Bluetooth compatibility with 4.0, 4.1
June 22, 2017	From v2 to v3	Added	Footnote for the Memory section
July 31, 2017	From v3 to v4	Removed	HP Touchpoint Manager from the Software section

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