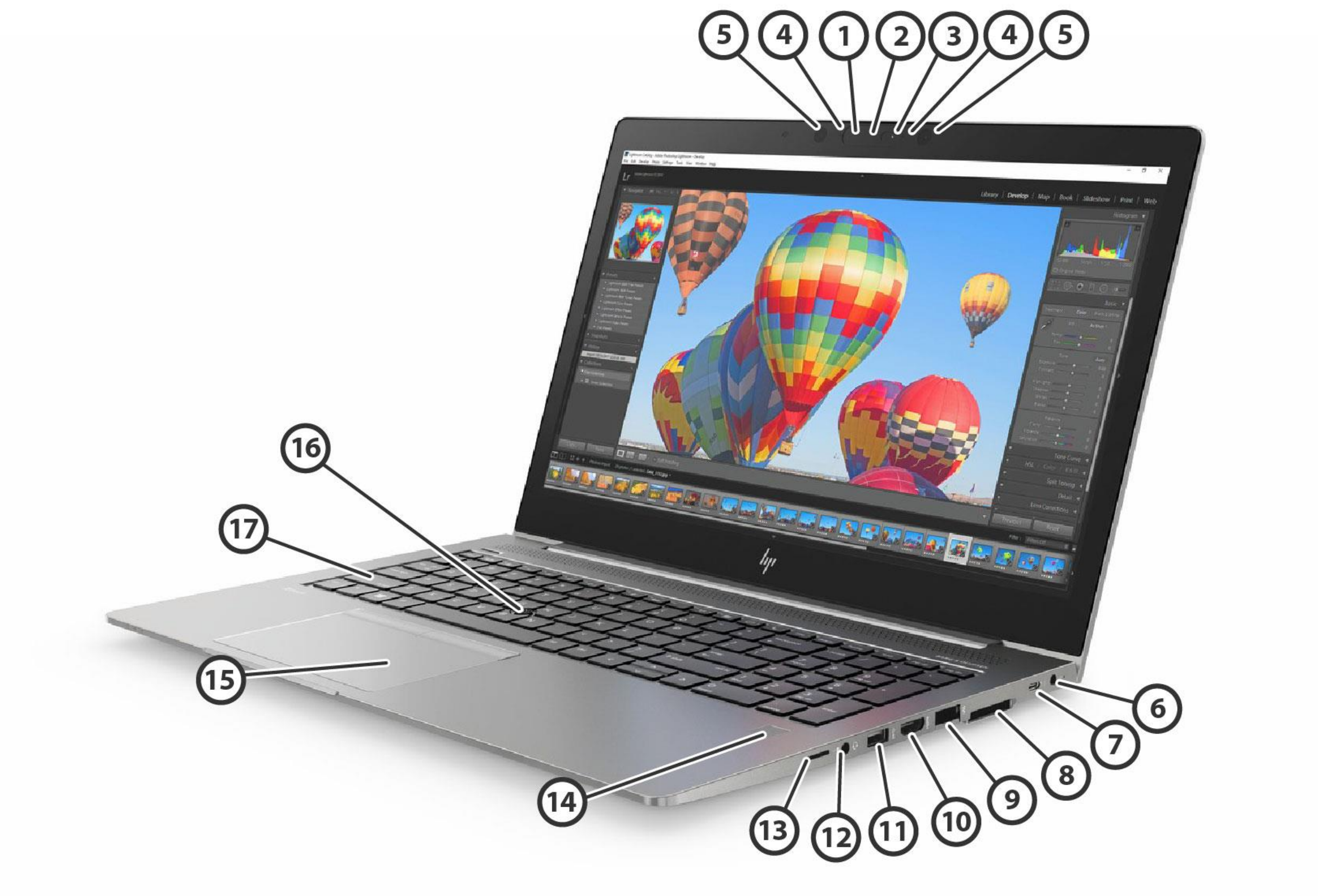
HP ZBook 15u G5 Mobile Workstation



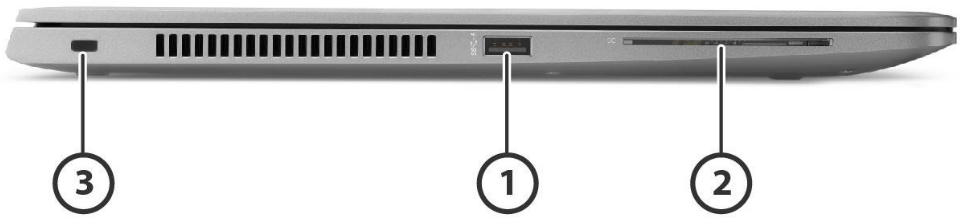
1. HD Camera (Select models only)
2. IR Camera (Select models only)
3. Webcam LED (Select models only)
4. Internal microphones
5. IR Camera LEDs (Select models only)
6. Power connector
7 USB Type-C™ with Thunderbolt™
8. Docking connector
9. Ethernet port

Front

10. HDMI port (Cable not included)
11. USB 3.1 Gen 1 port
12. Audio combo jack
13. SIM card slot[1]
14. Fingerprint sensor
15. Clickpad
16. Pointstick
17. HP Collaboration Keyboard

[1] All units have a SIM card slot and icon but units that do not support WWAN are shipped with a non-removable SIM slot plug

Overview



Left

1. 1 USB 3.0 (charging)
2. 1 smart card reader
3. Security lock slot

At A Glance

- Eye-catching ultraslim design, premium precision-crafted machined aluminum (CNC), seamless formed aluminum chassis for clean, crisp, premium look and feel Thin & light value performance industrial design,
- Tested and passed 14 MIL-STD-810G tests*.
- Workstation-caliber AMD Radeon Pro™ discrete graphics: AMD Radeon Pro™ WX3100 (2 GB dedicated GDDR5); AMD Enduro™ graphics technology.
- Intel® Integrated graphics: Intel® HD Graphics 620 integrated on 7th Generation Intel Core processors. Intel® UHD Graphics 630 integrated on 8th Generation Intel Core processors.ISV certified to provide fast and reliable performance with workstation applications, including manipulation of 3D textures
- Choice of dual core 7th generation Intel® Core™ i7 and i5 or quad core 8th generation Intel® Core™ i7 and i5 processors
- Intel® Core™ i7 with vPro™ and Core™ i5 with vPro™ technology (optional)
- HP Performance Advisor for optimal configuration, compatibility and performance
- Up to two SODIMMs supporting up to 32 GB DDR4-2400 MHz dual channel memory. Supports up to 3 independent displays via internal LCD Panel, system DisplayPort™, system VGA, or using the HP UltraSlim Docking Station or HP Thunderbolt Docking Station. Supports DisplayPort™ 1.2 monitors.
- Featuring HP Collaboration Keyboard with Clickpad to manage most commonly used conferencing functions with a single keystroke. HP Spill Resistant Collaboration Keyboard with Durakeyswith Duracoat finish. Backlight keyboard in full aluminum deck with magnesium bottom reinforcement, chemically strengthened glass clickpad, and updated system functions indicators. One touch access: Wireless On/Off, Volume Mute
- HP tuned 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, and new discrete amp.
- Up to 14 hours of battery life using an HP Long life battery solution: 3-cell (56 WHr) supporting HP Fast Charge Technology
    - 15.6-inch diagonal LED-backlit display: FHD IPS eDP anti-glare, 67% sRGB at 220 nits (1920x1080)
    - FHD IPS eDP + PSR anti-glare, 100% sRGB at 400 nits with ambient light sensor (1920x1080)
    - UHD IPS eDP + PSR anti-glare, 100% sRGB at 400 nits with ambient light sensor (3480x 2160)
    - FHD IPS eDP touch screen with Corning Gorilla Glass 3, 67% sRGB at 220 nits (1920x1080)
    - HP SureView Integrated Privacy Display FHD IPS eDP + PSR anti-glare 100% sRGB at 650 nits (1920x1080)
- Wireless connectivity options:
    - Intel® Dual Band Wireless-AC 8265 802.11 AC (2x2) WiFi and Bluetooth 4.2 combo adaptor (vPro™)
    - Intel® Dual Band Wireless-AC 8265 802.11 AC (2x2) WiFi and Bluetooth 4.2 combo adaptor (non-vPro™)
    - Realtek RTL8822BE 802.11ac 2x2 Wi-Fi and Bluetooth 4.2 combo adapter
    - Optional integrated wireless 4G (LTE) mobile broadband module support
- One dedicated drive slot. (1) M.2 slots support up to 2 TB of storageEnterprise grade security with HP SureStart Gen4, HP Privacy Camera[3], HP Sure View[2], HP Sure Run, HP Sure Recover, and Fingerprint sensor[2] Low halogen, ENERGY STAR® certified and EPEAT® Gold registered in the U.S. EPEAT® status varies by country- please see epeat.net.

* 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.

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

OPERATING SYSTEM

Preinstalled OS	Windows 10 Pro 64* Windows 10 Home Plus 64* FreeDOS 2.0
Supported OS	Windows 10 Enterprise 64*

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

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

PROCESSOR*

7th Generation Intel® Core™ i7-7600U with Intel® HD Graphics 620 (2.8 GHz base frequency, up to 3.9 GHz with Intel® Turbo Boost Technology, 4 MB cache, 2 cores)

7th Generation Intel® Core™ i7-7500U with Intel® HD Graphics 620 (2.7 GHz base frequency, up to 3.5 GHz with Intel® Turbo Boost Technology, 4 MB cache, 2 cores)

7th Generation Intel® Core™ i5 7300U vPro™ with Intel® HD 620 graphics (2.6 GHz, 3 MB cache, 2 cores) * Up to 3.5 GHz with Intel® Turbo Boost Technology

7th Generation Intel® Core™ i5 7200U with Intel® HD 620 graphics (2.5 GHz, 3 MB cache, 2 cores) * Up to 3.1 GHz with Intel® Turbo Boost Technology

8th Generation Intel® Core™ i7 8650U vPro™ with Intel® UHD 630 graphics (1.9 GHz, 8 MB cache, 4 cores) * Up to 4.2 GHz with Intel® Turbo Boost Technology

8th Generation Intel® Core™ i7 8550U with Intel® UHD 630 graphics (1.8 GHz, 8 MB cache, 4 cores) * Up to 4.0 GHz with Intel® Turbo Boost Technology

8th Generation Intel® Core™ i5 8350U vPro™ with Intel® HD 620 graphics (1.7 GHz, 6 MB cache, 4 cores) * Up to 3.6 GHz with Intel® Turbo Boost Technology

8th Generation Intel® Core™ i5 8250U with Intel® UHD 630 graphics (1.6 GHz, 6 MB cache, 4 cores) * Up to 3.4 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, branding and/or naming is not a measurement of higher performance.

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

CHIPSET

Intel® Kaby Lake Chipset integrated with 7th Generation processor

Intel® Kaby Lake – R Chipset integrated with 8th Generation processor

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

Intel® Core™ i5 with vPro™ and Core™ i7 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 mobile workstations 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™ 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™ technology is dependent on third- party software providers. Compatibility with future "virtual appliances" is yet to be determined.

GRAPHICS

Intel® HD 620 Graphics*

Intel® UHD 630 Graphics**

AMD Radeon Pro™ WX3100 (2 GB dedicated GDDR5) **

Microsoft DirectX 12 (Shader Model 5.0) and OpenGL 4.3capable

AMD Enduro™ Technology supported.

* HD content required to view HD images; only available on 7Th Generation Intel® processors
** UHD content required to view UHD images; only available on 8th Generation Intel® processors
** Supports up to 3 independent displays via internal LCD Panel, system HDMI 1.4, or using the HP UltraSlim Docking Station DisplayPort™ and VGA ports (sold separately).

DISPLAY

Internal

15.6" diagonal FHD IPS eDP anti-glare, 67% sRGB at 220 nits (1920x1080)
15.6" diagonal FHD IPS eDP + PSR anti-glare, 100% sRGB at 400 nits with ambient light sensor (1920x1080)
15.6" diagonal UHD IPS eDP + PSR anti-glare, 100% sRGB at 400 nits with ambient light sensor (3480x 2160)
15.6" diagonal FHD IPS eDP touch screen with Corning Gorilla Glass 3, 67% sRGB at 220 nits (1920x1080)
HP SureView Integrated Privacy Display 15.6” diagonal FHD IPS eDP + PSR anti-glare 100% sRGB at 650 nits (1920x1080)

External

Up to 30-bit (2^30) per pixel "Deep Color"
(total of 1,073,741,824 color variations)

HDMI 1.4b
Supports resolution up to 4k @ 24 Hz

Without HP Thunderbolt Dock G2:

HP ZBook 15u with hybrid graphics and without the use of a 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 1.4, Thunderbolt™ 3. HP ZBook 15u configuration with Intel® integrated graphics and without the use of a 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.

With HP UltraSlim Dock G2:

Supports up to 2 independent displays when docked on the HP Ultraslim Dock - Max. resolution = 2.5K @ 60Hz (DP1) & 2.5K @ 60Hz (DP2)11

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 15u configuration with hybrid graphics, a maximum of three independent displays are supported. These three displays are internal panel and two external displays connected to the ZBook dock's Thunderbolt™ 3, VGA, or two DisplayPort™ ports. When used together with the HP ZBook 15u 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. Max. resolution = 4K @60Hz (DP1) & 4K @60Hz (DP2) with Thunderbolt

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

STORAGE AND DRIVES

One (1) dedicated M.2 drive slots, supporting up to 2 TB of storage

M.2 SATA Solid State Drive:
128 GB SATA Solid State Drive
512 GB SATA TLC FIPS-140-2 Solid State Drive

HP Z Turbo Drive (NVMe PCIe SSD):
256 GB PCIe (NVMe) TLC Solid State Drive
512 GB PCIe (NVMe) TLC Solid State Drive
1 TB PCIe (NVMe) TLC Solid State Drive
2 TB PCIe (NVMe) TLC Solid State Drive
256 GB PCIe (NVMe) TLC Self Encrypting (SED) Solid State Drive
512 GB PCIe (NVMe) TLC Self Encrypting (SED) Solid State Drive
256 GB PCIe (NVMe) MLC Solid State Drive
512 GB PCIe (NVMe) MLC Solid State Drive
1 TB PCIe (NVMe) MLC Solid State Drive

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

DRIVE CONTROLLERS

M.2 Storage Bay (SATA):	SATA-3 for Solid State Drive
HP Z Turbo Drive:	PCIe Gen 3 x 4 lanes NVMe Solid State Drive
RAID:	Not supported

MEMORY

Standard
Up to 32 GB DDR4 1.2V Non ECC SDRAM
Transfer rates up to 2133MT/s on Intel Kaby Lake Chipset or Transfer rates up to 2400MT/s on Intel Kaby Lake – R Chipset
Two SODIMM slots supporting dual-channel memory
4 GB, 8GB and 16 GB SODIMMs

Maximum
Upgradeable to 32768 MB with optional 16384 MB SODIMMs in 2 slots

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

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

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.

NETWORKING/COMMUNICATIONS

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

* 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
Secure, integrated wireless LAN and wireless WAN options featuring support for the latest industry standards. 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) combined with the supported wireless LAN option.

802.11 Wireless LAN*

Intel® Dual Band Wireless-AC 8265 802.11 AC (2x2) WiFi + Bluetooth 4.2 Combo Adaptor* (vPro)
Intel® Dual Band Wireless-AC 8265 802.11 AC (2x2) WiFi + Bluetooth 4.2 Combo Adaptor* (non-vPro)
Realtek RTL8822BE 802.11 ac (2x2) WiFi + Bluetooth 4.2 Combo Adapter*

Wireless WAN - Mobile Broadband **

Intel XMM 7360 LTE-Advanced Broadband Module (optional)
HP lt4132, LTE/HSPA+ 4G Mobile Broadband Module (optional)

Miracast***
Native Miracast Support

Near Field Communications (NFC)
NXP NPC300 Near Field Communication Module (optional)

* 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.

*** Miracast is a wireless technology your PC can use to project your screen to TVs, projectors, and streaming

AUDIO/MULTIMEDIA

Audio
Audio custom tuned by HP and Bang and Olufsen audio
Integrated stereo speakers
Integrated HP World Facing 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
720 HD webcam
720 HD webcam with infrared (IR) imaging (optional)

  - Microsoft Hello Certification: Microsoft face authentication in Windows 10 is an enterprise-grade identity verification mechanism
  - Microsoft Skype for Business1 Certified
  - HD format (widescreen 16:9)
  - 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

HP Privacy Camera Shutter (only available on non-touch configurations)

* HD content required to view HD images.

KEYBOARDS/POINTING DEVICES/BUTTONS & FUNCTION KEYS

Keyboard

Optional backlit HP Collaboration 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 102-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 18.0 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
Dual Point Stick

Function Keys

Function keys provide control of the following features: standby mode, external display, volume down, volume up HP Power Assistant (Windows® 7 only), and display brightness.

F1 - Display Switching
F2 - Blank or SureView
F3 - Brightness Down
F4 - Brightness Up
F5 - Audio Mute
F6 - Volume Down
F7 - Volume Up
F8 - Mic Mute
F9 - Blank or Backlit Toggle
F10 - Numlk
F11 - Wireless
F12 - Calendar
>Share/Present
>Call Answer
>Call End

Hidden Fuctions

Fn+R = Break
Fn+S = Sys Rq
Fn+C = Scroll Lock

SOFTWARE AND SECURITY

Preinstalled Software with Windows Operating System

BIOS

HP BIOSphere Gen4[1]
HP DriveLock | HP Automatic DriveLock
BIOS Update via Network
Master Boot Record Security
Power On Authentication
Secure Erase[3]
Absolute Persistence Module[4]

Features

Pre-boot Authentication
HP Wireless Wakeup

Multi Media
Cyberlink Power MediaPlayer CMIT

Communication / Connectivity
HP Mobile Connect Pro[5]
Native Miracast Support[6]
HP LAN-WLAN Protection
HP MAC Address Manager (select models only)
HP Wireless Wakeup (select models only)
HP SureConnect
HP Noise Cancellation Software

HP Value Add Software
HP 3D DriveGuard 6
HP ePrint Driver + JetAdvantage[7]
HP Hotkey Support
HP Recovery Manager
HP Jumpstart
HP Support Assistant[12]
HP Performance Advisor
HP Remote Graphics Software
HP Velocity

Microsoft Products
Buy Office
Bing Search
Skype[8]

Manageability
HP Driver Packs [9]
HP SoftPaq Download Manager (SDM)
HP System Software Manager (SSM) [9]
HP BIOS Config Utility (BCU) [9]
HP Client Catalog [9]
HP Manageability Integration Kit Gen 2 for Microsoft SCCM [10]
HP Image Assistant
LANDESK Management [11]

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

Client Security Software

- HP Client Security Suite Gen4[13]
- HP Security Manager (including Credential Manager Password Manager and HP Spare Key)
- HP Fingerprint Sensor
- Power On Authentication
- Device Access Manager
- Microsoft Defender [14]
- HP WorkWise[15]

Standard
HP BIOSphere Gen4 [23]
HP DriveLock & Automatic DriveLock

Features

BIOS Update via Network
Secure Erase[24]
Pre-boot Authentication
TPM 2.0 Embedded Security Chip shipped with Windows 10 (Common Criteria EAL4+ Certified)[37]
SATA 0,1 port disablement (viaBIOS)
RAID configurations[37]
Serial, USB enable/disable (viaBIOS)
Power-on password (viaBIOS)
Setup password (viaBIOS)
Support for chassis padlocks and cable lock devices
HP Sure Click[38]
HP Sure Start Gen4[35]
HP Sure Run[39]
HP Sure Recover[40]

TPM
Model: Infineon SLB9670
Version: 7.63.3353.0
Revision: TPM 2.0
FIPS 140-2 Compliant: Yes (select models only)

IPv6 Certification:
Yes
MD5 Hash:
Please follow the instructions below to access MD5 Hash.
Log-on to http://hp.com/support, enter your product name, select software and drivers, select OS, select driver. After selecting
the driver, click on “Associated files” and then click on “Download”. When opening the file, under “Purpose” you should see the
appropriate “SOFTPAQ MD5:” Field
Is the BIOS on this notebook ISO/IEC 19678:2015 (formerly NIST 800-147) compliant?
Yes
UEFI version: 2.5

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

1.Requires Intel® 7th generation processors or greater
2.Available on HP Elite and Z products equipped with Intel® 7th generation processors or greater
3.For the methods outlined in the National Institute of Standards and Technology Special Publication 800-88. Supported on Elite and Z platforms with BIOS version F.03 or higher
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). 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. As of September 2017, HP WorkWise will no longer support iOS or iPhone® devices.
Miracast is a wireless technology your PC can use to project your screen to TVs, projectors, and streaming
23. HP BIOSphere Gen4 features may vary depending on the PC platform and configurations requires 8th Gen Intel® processors.
24. Secure Erase for the methods outlined in the National Institute of Standards and Technology Special Publication 800-88. Supported on Elite platforms with BIOS version F.03 or higher.
25. 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.
26. HP ePrint Driver 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). Print times and connection speeds may vary.
27. HP Support Assistant requires Windows and Internet access.
28. HP Driver Packs not preinstalled, however available for download at http://www.hp.com/go/clientmanagement.
29. HP Manageability Integration Kit can be downloaded from http://www8.hp.com/us/en/ads/clientmanagement/overview.html
30. Ivanti Management Suite subscription required.
31. HP Client Security Suite Gen4 requires Windows and Intel® or AMD 8th generation processors.
32. HP Password Manager requires Internet Explorer or Chrome or FireFox. Some websites and applications may not be supported. User may need to enable or allow the add-on / extension in the internet browser.
33. Microsoft Defender Opt in and internet connection required for updates.
34. HP PhoneWise Client is only available on select platforms. For supported platforms and HP PhoneWise system requirements see http://www.hp.com/go/HPPhoneWise.
35. HP Sure Start Gen4 is available on HP EliteBook products equipped with Intel® 8th generation processors
36. HP Fingerprint Sensor sold separately or as an optional feature.
37. RAID configuration is optional and does require a second hard drive.
38. HP Sure Click is available on select HP platforms and supports Microsoft® Internet Explorer and Chromium™. Check http://h20195.www2.hp.com/v2/GetDocument.aspx?docname=4AA7-0922ENW for all compatible platforms as they become available.
39. HP Sure Run is available on HP Elite products equipped with Intel® or AMD® 8th generation processors
40. 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

Workstation ISV Certifications

Find 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

Get the most out of your HP Workstation on day one—and every day thereafter. Designed for all users regardless of technical background, this ultra-savvy software wizard is the simplest and most effective way to make sure your computer is always operating at its optimum potential.
Download at: http://www.hp.com/go/performanceadvisor

Features

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.

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 accidently 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.

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.

POWER

Power Supply

HP Smart 45 W External AC power adapter[42]
HP Smart 45 W External AC power adapter, 2-prong (Japan only) [42]
HP Smart 65 W External AC power adapter[42]
HP Smart 65 W EM External AC power adapter[42]
45 W USB Type-C™ adapter[42]
65 W USB Type-C™ adapter[42]
HP 65W Slim Smart AC Adapter

Primary Battery
HP Long Life 3-cell Lithium Polymer Battery (56 WHr) supporting HP Fast Charge Technology

Power Cord
2-wire plug - 1.0m (Japan only) [42]
3-wire plug - 1.0m[42]
3-wire plug - 1.8m[42]
Duckhead power cord - 1.0m[42]

Duckhead power cord - 1.8m[42]

Battery Life
Battery life up to 14 hours *

System Standby Time
Up to 1 week**

*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
AMD® Polaris™ Technology
Hibernation
Standby
ACPI compliance

ENVIRONMENTAL

US ENERGY STAR®
IT ECO declaration
EPEAT® Gold; 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.

NOTE: 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.

WEIGHTS & DIMENSIONS

Features

Weight

Non-Touch starting at	3.89 lb (1.77 kg)
Touch starting at	4.25 lb (1.93 kg)

Dimensions (w x d x h)

Non-Touch
14.6 x 9.91 x 0.72 in
370.8 x 251 x 18.25 mm

Touch
14.6 x 9.91 x 0.73 in
370.8 x 251 x 18.6 mm

NOTE: Height varies depending upon where on the notebook the measurement is made. Weight varies by configuration and components. Weight includes 3 cell 56Whr battery, without hard drive and with 256 GB Z Turbo Drive (PCIe SSD).

PORTS/SLOTS

Ports

Left side:

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

Right side:

(1) Thunderbolt 3™
(1) USB 3.0 Port
(1) Headphone/Microphone Combo
(1) RJ-45 / Ethernet
(1) Side Docking connector
(1) Power connector
(1) SIM Card Slot

Digital Media Slots

(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 the same 1-year or 3-year limited warranty as the platform. Optional[1] 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.

1. 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 dc @ 3.3 A
	Average Operating Power	**Windows® 10 (64-bit)** AMD FirePro™ Graphics
	Max Operating Power	< 45 W with UMA < 65 W with discrete
Temperature	**Operating**	32° to 95° F (0° to 35° C) (not writing optical) 41° to 95° F (5° to 35° C) (writing optical)
	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 15,000 ft. (-15.24 to 12,192 m)
Planned Industry Standard Certifications	**UL**	Yes
	CSA	Yes
	FCC Compliance	Yes
	ENERGY STAR®	Select models*
	EPEAT®	Gold **
	ICES	Yes
	Australia / NZ A-Tick Compliance	Yes
	CCC	Yes
	Japan VCCI Compliance	Yes
	KCC	Yes
	BSMI	Yes
	CE Marking Compliance	Yes
	MIL STD* **	Passed 14 Mil STD Tests

* Configurations of the HP ZBook 15u G5 that are ENERGY STAR® certified are identified as HP ZBook 15u G5 ENERGY STAR® on HP websites and on http://www.energystar.gov.

** EPEAT registration varies by country. See http://www.epeat.net for registration status by country.
EPEAT status listed above applies to U.S.

*** 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: http://www.hp.com/accessibility.

Technical Specifications – Displays

DISPLAYS

15.6" diagonal LED backlit FHD IPS eDP anti-glare, 67% sRGB at 220 nits (1920x1080)	**Outline Dimensions** (W x H)	350.96 x 216.75 (max.)	
	Active Area	344.16 x 193.59 (typ.)	
	Weight	370g max.	
	Diagonal Size	15.6 inch	
	Thickness	3.2mm max.	
	Interface	eDP 1.2	
	Panel Technology	IPS	
	Surface Treatment	Anti-glare	
	Touch enabled	No	
	Contrast Ratio	600:1 (typ.) - AG	
	Refresh Rate	60Hz	
	Brightness	220 nits typical (panel only)	
	Pixel Resolution	**Format**	1920 x 1080 (FHD)
		Configuration	RGB
	Backlight	LED	
	Color Gamut Coverage	67% sRGB	
	Color Depth	6 bits + Hi FRC	
	Viewing Angle	UWVA 85/85/85/85	

15.6" diagonal LED Backlit FHD IPS eDP + PSR anti-glare, 100% sRGB at 400 nits with ambient light sensor (1920x1080)	**Outline Dimensions** (W x H)	350.96 x 216.75 (max.)	
	Active Area	344.16 x 193.59 (typ.)	
	Weight	370g max.	
	Diagonal Size	15.6 inch	
	Thickness	3.2mm max.	
	Interface	eDP 1.3 + PSR (2 lane)	
	Panel Technology	IPS	
	Surface Treatment	Anti-Glare (AG)	
	Touch Enabled	No	
	Contrast Ratio	600:1 (typical)	
	Refresh Rate	60Hz	
	Brightness	400 nits typical (panel only)	
	Pixel Resolution	**Format**	1920 x 1080 (FHD)
		Configuration	RGB
	Backlight	LED	
	Color Gamut Coverage	100% sRGB	
	Color Depth	6 bits + Hi FRC	
	PPI	157	
	Viewing Angle	UWVA 85/85/85/85	

Technical Specifications – Displays

15.6" diagonal UHD IPS eDP + PSR anti-glare, 100% sRGB at 400 nits with ambient light sensor (3840x 2160)	**Outline Dimensions** (W x H)	350.96 x 216.95 (max.)	
	Active Area	344.21 x 193.62 (typ.)	
	Weight	320g max.	
	Diagonal Size	15.6”	
	Thickness	2.6mm (max.)	
	Interface	eDP 1.3 + PSR	
	Panel Technology	IPS	
	Surface Treatment	AG	
	Contrast Ratio	1200:1 (typ.)	
	Touch Enabled	No	
	Refresh Rate	60Hz	
	Brightness	400 nits typical (panel only)	
	Pixel Resolution	**Format**	3280 x 2160 (UHD)
		Configuration	RGB
	Backlight	LED	
	Color Gamut Coverage	100% sRGB	
	Color Depth	8 bit	
	Viewing Angle	UWVA 85/85/85/85	

15.6" diagonal FHD IPS eDP touch screen with Corning Gorilla Glass 3, 67% sRGB at 220 nits (1920x1080)	**Outline Dimensions** (W x H)	350.96 x 216.75 (max.)	
	Active Area (W x H)	344.16 x 193.59 (typ.)	
	Weight	568g (max.)	
	Diagonal Size	15.6 inch	
	Thickness	3.4mm (max.)	
	Interface	eDP 1.2	
	Panel Technology	IPS	
	Touch enabled	Yes with Corning Gorilla Glass 3	
	Contrast Ratio	600:1 (typ.)	
	Refresh Rate	60Hz	
	Brightness	220 nits typical (panel only)	
	Pixel Resolution	**Format**	1920 x 1080 (FHD)
		Configuration	RGB
	Backlight	LED	
	Color Gamut Coverage	67% sRGB	
	Color Depth	6 bits + Hi FRC	
	Viewing Angle	UWVA 85/85/85/85	

Technical Specifications – Displays

HP SureView Integrated Privacy Display 15.6" diagonal FHD IPS eDP + PSR anti-glare 100% sRGB at 650 nits (1920x1080)	**Outline Dimensions** (W x H)	350.96 x 216.75 (max.)	
	Active Area (W x H)	344.46 x 193.89 (typ.)	
	Weight	320g (max.)	
	Diagonal Size	15.6 inch	
	Thickness	2.80mm (max.)	
	Interface	eDP 1.4 + PSR	
	Panel Technology	IPS	
	Surface Treatment	AG	
	Touch enabled	No	
	Contrast Ratio	Sharing mode, 600:1 (typ.) Privacy mode, 150:1 (typ.)	
	Refresh Rate	120Hz	
	Brightness	Sharing mode, 650 nits (typ.) Privacy mode, 350 nits (typ.)	
	Pixel Resolution	**Format**	1920 x 1080 (FHD)
		Configuration	RGB
	Backlight	LED	
	Color Gamut Coverage	100% sRGB	
	Color Depth	8 bits	
	Viewing Angle	Sharing mode, CR > 10 L/R/U/D, 85/85/85/85 Privacy mode, CR > 2 L/R/U/D, 50/50/85/85	

Technical Specifications – Storage

STORAGE AND DRIVES*

128 GB M.2 SATA TLC Solid State Drive	**Drive Weight**	0.02 lb (10g)	
	Capacity	128 GB	
	Height	0.09 in (2.3mm)	
	Width	0.87 in (22mm)	
	Interface	ATA-8, SATA 3.0	
	NAND Type	TLC	
	Form Factor I/O	M.2 2280	
	Performance	**Maximum Sequential Read**	**Maximum Sequential Write**
		Up to 520 MB/s	Up to 450 MB/s
	Logical Blocks	250,069,680	
	Operating Temperature	32 to 158F (0 to 70C) [ambient temp]	
	Features	DIPM; TRIM; DEVSLP	
HP Z Turbo Drive 512 GB, M.2 SATA TLC FIPS Solid State Drive	**Drive Weight**	0.02 lb (10 g)	
	Capacity	512 GB	
	Height	0.09 in (2.3 mm)	
	Width	0.87 in (22 mm)	
	NAND Type	TLC	
	Form-Factor (I/O)	M.2 2280	
	Interface	ACS-3, SATA 3.2	
	Performance	**Maximum Sequential Read**	**Maximum Sequential Write**
		Up to 530 MB/s	Up to 400 MB/s
	Logical Blocks	1,000,215,216	
	Operating Temperature	32° to 158°F (0° to 70°C) [ambient temp]	
	Features	ATA Security; TCG Opal 2.0; FIPS; DIPM; TRIM; DEVSLP	
HP Z Turbo Drive 1 TB, M.2 NVMe MLC Solid State Drive	**Drive Weight**	0.02 lb (10 g)	
	Capacity	1024 GB	
	Height	0.09 in (2.3 mm)	
	Width	0.87 in (22 mm)	
	NAND Type	MLC	
	Form-Factor (I/O)	M.2 2280	
	Interface	PCIe NVMe Gen3X4	
	Drive Weight	0.02 lb (10 g)	
	Performance	**Maximum Sequential Read**	**Maximum Sequential Write**
		Up to 3,000 MB/s	Up to 2,900 MB/s
	Logical Blocks	2,000,409,264	
	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 MLC Solid State Drive	**Drive Weight**	0.022 lb (10 g)	
	Capacity	512 GB	
	Height	0.09 in (2.3 mm)	

Technical Specifications – Storage

	Width	0.87 in (22 mm)	
	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 1500MB/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	
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)	
	NAND Type	MLC	
	Form-Factor (I/O)	M.2 2280	
	Interface	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 2 TB, M.2 NVMe TLC Solid State Drive	**Drive Weight**	0.02 lb (10 g)	
	Capacity	2 TB	
	Height	0.09 in (2.3 mm)	
	Width	0.87 in (22 mm)	
	NAND Type	TLC	
	Form-Factor (I/O)	M.2 2280	
	Interface	PCIe NVMe Gen3X4	
	Performance	**Maximum Sequential Read**	**Maximum Sequential Write**
		2,900 MB/s	2,100 MB/s
	Logical Blocks	3,907,029,168	
	Operating Temperature	32° to 158°F (0° to 70°C) [ambient temp]	
	Features	ATA Security; DIPM; TRIM; DEVSLP	

Technical Specifications – Storage

HP Z Turbo Drive 1 TB, M.2 NVMe TLC Solid State Drive	**Drive Weight**	0.02 lb (10g)	
	Capacity	1 TB	
	Height	0.09 in (2.3mm)	
	Width	0.87 in (22mm)	
	NAND Type	TLC	
	Form-Factor (I/O)	M.2 2280	
	Interface	PCIe NVMe Gen3X4	
	Performance	**Maximum Sequential Read**	**Maximum Sequential Write**
	Performance	Up to 2800 MB/s	Up to 1600 MB/s
	Logical Blocks	2,000,409,264	
	Operating Temperature	32 to 158F (0 to 70C) [ambient temp]	
	Features	TRIM; L1.2	

HP Z Turbo Drive 512 GB, M.2 NVMe TLC Solid State Drive	**Drive Weight**	0.02 lb (10g)	
	Capacity	512 GB	
	Height	0.09 in (2.3mm)	
	Width	0.87 in (22mm)	
	NAND Type	TLC	
	Form-Factor (I/O)	M.2 2280	
	Interface	PCIe NVMe Gen3X4	
	Performance	**Maximum Sequential Read**	**Maximum Sequential Write**
		Up to 2600 MB/s	Up to 1400 MB/s
	Logical Blocks	1,000,215,216	
	Operating Temperature	32 to 158F (0 to 70C) [ambient temp]	
	Features	TRIM; L1.2	

HP Z Turbo Drive 256 GB, M.2 NVMe TLC Solid State Drive	**Drive Weight**	0.02 lb (10 g)	
	Capacity	256 GB	
	Height	0.09 in (2.3 mm)	
	Width	0.87 in (22 mm)	
	NAND Type	TLC	
	Form-Factor (I/O)	M.2 2280	
	Interface	PCIe NVMe Gen3X4	
	Performance	**Maximum Sequential Read**	**Maximum Sequential Write**
		Up to2,600 MB/s	Up to 900 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	

Technical Specifications – Storage

HP Z Turbo Drive 512 GB, M.2 NVMe Self Encrypting TLC Solid State Drive	**Drive Weight**	0.02 lb (10 g)	
	Capacity	512 GB	
	Height	0.09 in (2.3 mm)	
	Width	0.87 in (22 mm)	
	NAND Type	TLC	
	Form-Factor (I/O)	M.2 2280	
	Interface	PCIe NVMe Gen3X4	
	Performance	**Maximum Sequential Read**	**Maximum Sequential Write**
		Up to 2,600 MB/s	Up to 1,400 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; OPAL 2, L1.2	

HP Z Turbo Drive 256 GB, M.2 NVMe Self-Encrypting TLC Solid State Drive	**Drive Weight**	0.02 lb (<10g)	
	Capacity	256 GB	
	Height	0.14 in (3.58mm)- 0.09 in (2.23mm)	
	Width	0.87 in (22mm)	
	NAND Type	TLC	
	Form-Factor (I/O)	M.2 2280	
	Interface	PCIe NVMe Gen3X4	
	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 158F (0 to 70C) [ambient temp]	
	Features	ATA Security (Option); TRIM; OPAL 2; L1.2	

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

SECURITY

HP Fingerprint Sensor	**Voltage**	3.0-3.6V
	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
Smart Card Reader	**Smart card standard**	PC/SC 2.0 for Windows smart card standard
	Dimensions (L x W x H)	0.41x 0.08 x 0.32 in (10.5 x 2 x 8.2 mm)
	Smart Card support	ISO 7816 Class A and AB smart cards
	Smart Card Interface	Smart Card Interface with T = 0 and T = 1 support Support I2C memory card, SLE4418, SLE4428, SLE4432, SLE4442, SLE4436, SLE5536, SLE6636, AT88SC1608, AT45D041 card and AT45DB041 card via external EEPROM
	Operating systems	Normal Mode With card present, before being suspended: 40.9 mA Without card present, before being suspended: 33.16 mA After being suspended with smart card present: 380 µA After being suspended without smart card present: 380 µA
	Features	**Power Saving Mode**: With card present, before being suspended: 40.6 mA Without card present: 380 µA After being suspended with smart card present: 380 µA • Support single slot • Support T0, T1 protocol • Support I2C memory card, SLE4418, SLE4428, SLE4432, SLE4442, SLE4436, • SLE5536, SLE6636, AT88SC1608, AT45D041 card and AT45DB041 card via external EEPROM • Support ISO7816 Class A, B and C (5V/3V/1.8V) card • Implemented as an USB full speed device with bulk transfer endpoint, Mass • Storage endpoint • Built-in PLL for USB and Smart Card clocks requirement • Support EEPROM for USB descriptors customization (PID/VID/ iManufacturer/iProduct/Serial Number), Direct Web Page Link, and accessing memory card module. • EEPROM programmable via USB interface • Support software update for memory card module • Support Direct Web Page Link via configuration in external EEPROM • Support short APDU and extended APDU • Compatible with Microsoft USB-CCID driver • Support remote wake up through inserting card/removing card • Support USB selective suspend • Support Power Saving Mode (Using one pin to select between Normal/PWR Saving Mode) • Support card power over current protection mechanism • Built in resonator. • Support USB LPM (Link Power Management) features. • Embedded clock source.

NETWORKING/COMMUNICATION

Technical Specifications – Networking

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 8023. 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® 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.
	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® 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 10 Mbit/s operation (10BASE-T; IEEE 802.3i; IEEE 802.3 clauses 13-14) 100 Mbit/s operation (100BASE-TX; IEEE 802.3u; IEEE 802.3 clauses 21-30) 1000 Mbit/s operation (1000BASE-T; IEEE 802.3ab; IEEE 8023. Clauses 40) Auto-Negotiation (Automatic Speed Selection) Full Duplex Operation at all Speeds, Half Duplex operation at 10 and 100 Mbit/s 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 lt4132 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.

Intel XMM 7360 LTE-Advanced Mobile Broadband Module

Technology/Operating bands	FDD LTE: 2100 (Band 1), 1900 (Band 2), 1800 (Band 3), 1700/2100 (Band 4), 850 (Band 5), 2600 (Band 7), 900 (Band 8), 1400 (Band 11), 700 (Band 12 lower), 700 (Band 13 upper), 700 (Band 17 lower), 850 (Band 18 lower), 850 (Band 19 upper), 800 (Band 20), 1400 (Band 21), 850 (Band 26), 700 (Band 28), 700 (Band 29 RX only), 2300 (Band 30), 2100 (Band 66). TDD LTE: 2600 (Band 38), 1900 (Band 39), 2400 (Band 40), 2500 (Band 41). HSPA+: 2100 (Band 1), 1900 (Band 2), 1700/2100 (Band 4), 850(Band 5), 900 (Band 8)
Wireless protocol standards	3GPP Release 11 LTE Specification CAT.9, DL 60 MHz BW throughput up to 450Mbps; UL 20MHz throughput up to 50Mbps WCDMA R99, 3GPP Release 5, 6, 7 and 8 UMTS Specification
GPS	Standalone A-GPS (MS-A, MS-B and XTRA)
GPS bands	1575.42MHz +/- 1.023MHz, GLONASS 1596-1606MHz, Beidou 1561.098MHz

Technical Specifications – Networking

Maximum output power	LTE: 23dBm HSPA+: 23dBm
Maximum power consumption	LTE: 1,200mA (peak); 900mA (average) HSPA+: 1,100mA (peak); 800mA (average)
Form Factor	M.2, 3042-S3 Key B
Weight	5.8g
Dimensions (Length x Width x Thickness)	42 x 30 x 2.3mm

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	
	Security[1]	• 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	

Technical Specifications – Networking

Output Power[2]	• 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	
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 Sensitivity[3]	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 Non-operating	14° to 158° F (-10° to 70° C) -40° to 176° F (-40° to 80° C)
Humidity	Operating Non-operating	10% to 90% (non-condensing) 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	

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
	Security[1]	• 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 access points
	Output Power[2]	• 802.11b : +16dBm minimum • 802.11g : +14dBm minimum • 802.11a : +14dBm minimum

Technical Specifications – Networking

- 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 Sensitivity[3]	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) 802.11b:-95 dBm (1 Mbps), -93 dBm (2 Mbps), -91 dBm (5.5 Mbps), -88 dBm (11 Mbps) 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) 802.11n:-69 dBm (150 Mbps), -66 dBm (300 Mbps)	
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)
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	

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).

Realtek RTL8822BE 802.11ac 2x2 Wi-Fi + BT4.2 Combo Adapter

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 no support this band)

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 ~ MCS9, (1SS, and 2SS) (20MHz, 40MHz, and 80MHz)

Modulation

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

Security[1]

- IEEE and WiFi compliant 64 / 128 bit WEP encryption for a/b/g mode only
- AES-CCMP: 128 bit in hardware
- 802.1x authentication
- WPA, WPA2: 802.1x. WPA-PSK, WPA2-PSK, TKIP, and AES.
- WPA2 certification
- IEEE 802.11i
- Cisco Certified Extensions, all versions through CCX4 and CCX Lite
- WAPI

Network Architecture Models

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

Roaming

IEEE 802.11 compliant roaming between access points

Output Power[2]

TX Power(dBm)	Min	Typical	Max
802.11b	+14	+15.5	
802.11g	+12	+13.5	

802.11a	+12	+13.5	
802.11n HT20(2.4GHz)	+12	+13.5	
802.11n HT40(2.4GHz)	+12	+13.5	
802.11n HT20(5GHz)	+10	+11.5	
802.11n HT40(5GHz)	+10	+11.5	
802.11ac VHT80(5GHz)	+10	+11.5	

Power Consumption

Transmit: 2.0 W (max)
Receive: 1.6 W (max)
Idle mode (PSP): 180 mW (WLAN Associated)
Idle mode: 50 mW (WLAN unassociated)
Connect Standby: 10 mW (WLAN+BT)
Radio disabled: 8 mW

Power Management

ACPI and PCI Express compliant power management
802.11 compliant power saving mode

Receiver Sensitivity[3]

RX Sensitivity(dBm)	Min	Typical	Max
802.11b, 1Mbps		-95	-93.5
802.11b, 11Mbps		-85.5	-84
802.11a/g, 6Mbps		-87.5	-86
802.11a/g, 54Mbps		-73.5	-72
802.11n, MCS07		-68.5	-67
802.11n, MCS15		-65.5	-64
802.11ac, MCS0		-85.5	-84
802.11ac, MCS9		-60.5	-59

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)

WoWLAN

Support S3/S4 both AC and DC mode

LED Activity

LED Amber – Radio OFF; LED White – Radio ON

Technical Specifications – Networking

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 4.2 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 I Bluetooth device with a maximum transmit power of + 4 dBm for BR and EDR.

Receiver Sensitivity

Modulation	0.01% BER	0.001% BER
GFSK	-80 dBm	-70 dBm
π/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

Range Up to 33 ft (10 m)

Electrical Interface USB 2.0 compliant

Bluetooth Software Supported Microsoft Windows Bluetooth Software

Link Topology

Electrical Interface Point to Point, Multipoint Pico Nets up to 7 slaves

Bluetooth Software Supported Full support of Bluetooth Security Provisions

Security

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:

Certifications FCC (47 CFR) Part 15C, Section 15.247 & 15.249

Bluetooth Profiles Supported

Power Management ETS 300 328, ETS 300 826

Certifications Low Voltage Directive IEC950

Certifications UL, CSA, and CE Mark

Bluetooth Profiles Supported Serial Port Profile (SPP)[1,2]
Service Discovery Application Profile (SDAP)

Technical Specifications – Networking

<table>
<tr><td></td><td></td><td>Dial-Up Networking (DUN)$^{1.1}$
Generic Object Exchange Profile (GOEP)^{1,2}
Object Push Profile (OPP)^{1,1}
Hard Copy Cable Replacement (HCRP)^{1,0}
Personal Area Network User (PANU)$^{1.0}$
Human Interface Device (HID)$^{1.1}$ Host
Human Interface Device Profile (HID)$^{1.1}$
Hands Free Profile (HFP) $^{1.5/1.6}$
Hands Free Profile (HFP) $^{1.5/1.6}$ Client
Advanced Audio Distribution Profile (A2DP) $^{1.2}$
Audio Video Remote Control Profile (AVRCP) $^{1.3/1.4}$
Generic Access Profile (GAP)
Bluetooth LE Generic Attribute (GATT) Client
Device ID Profile (DI)$^{1.3}$
HID over GATT Profile(HOGP)$^{1.0}$
Phone Book Access Profile(PBAP)$^{1.1}$
Message Access Profile(MAP)$^{1.1}$ Client</td></tr>
<tr><td></td><td>Bluetooth V4.1/V4.2 support Feature</td><td>V4.1: ESR5/6/7 compliant
V4.2: ESR8 compliant, LE Secure Connection – Basic</td></tr>
<tr><td>HP Integrated Module with Bluetooth® 4.2 Wireless Technology</td><td>Bluetooth® Specification</td><td>4.2 Compliant</td></tr>
<tr><td></td><td>Frequency Band</td><td>2402 to 2480 MHz</td></tr>
<tr><td></td><td>Number of Available Channels</td><td>Legacy: 0~79 (1 MHz/CH)
BLE: 0~39 (2 MHz/CH)</td></tr>
<tr><td></td><td>Data Rates and Throughput</td><td>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)</td></tr>
<tr><td></td><td>Transmit Power</td><td>The Bluetooth component shall operate as a Class II Bluetooth device with a maximum transmit power of +4 dBm for BR and EDR</td></tr>
<tr><td></td><td>Receiver Sensitivity</td><td><table>
<tr><th>Modulation</th><th>0.01% BER</th><th>0.001% BER</th></tr>
<tr><td>GFSK</td><td>-80 dBm</td><td>-70 dBm</td></tr>
<tr><td>π/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>
</table></td></tr>
<tr><td></td><td>Power Consumption</td><td>Peak (Tx) 330 mW
Peak (Rx) 230 mW
Selective Suspend 17 mW</td></tr>
<tr><td></td><td>Antenna</td><td>Internally integrated within module</td></tr>
<tr><td></td><td>Range</td><td>Legacy Up to 33 ft (10 m)
BLE Up to 99 ft (30 m)</td></tr>
<tr><td></td><td>Electrical Interface</td><td>USB 2.0 compliant</td></tr>
</table>

Technical Specifications – Networking

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 Certifications	Microsoft Windows ACPI, and USB Bus Support 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 certificactions	ETS 300 328, ETS 300 826 Low Voltage Directive IEC950 UL, CSA, and CE Mark
Certifications 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 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)
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.

Near Field Communications (NFC)

Controller	NFC Mirage WNC XRAV-1 (NXP NPC300 I2C 10mmx17mm)
Supports	• Windows 10 • NFC Forum Compliant • Near Field Communications Controller
Dimensions (L x W x H)	Module 25 mm by 10 mm by 2.0 mm
Chipset	NPC300
System interface	I2C

Technical Specifications – Networking

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)
Mode[1]	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) Mode Power Consumption,** Typical2 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
Antenna connector	0.5mm pitch, 7 connector FPC. Antenna matching is external to module.
Notes	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.

AUDIO/MULTIMEDIA – BANG & OLUFSEN

Hardware	**Implementation**	Conexant CX7750
	Function Key Volume Controls	Volume up, volume down, and mute
	Line In/Line Out	Yes, via dock
	Headphone/Microphone in	Yes combo jack
	Integrated Microphone	Yes, Tri digital microphone array when equipped with optional webcam
Audio Output Quality	**Frequency Response**	20 Hz - 20 kHz
	Signal to Noise Ratio	104 dB
	Total Harmonic Distortion+noise @-3dBFS	-90dBFS
	Noise Floor	-110 dB
	Play/Record Sampling Rate(s)	8 kHz – 48kHz
	DAC	192kHz
	ADC	96kHz
Integrated Stereo Speakers	**Power Rating**	2 Watts
	Impedance	4 Ohms

POWER

HP 65W Smart AC Adapter	**Dimensions**	107.0x47.0x30.0mm	
	Weight	unit: 250g +/- 10g	
	Input	90 to 265 VAC	
		Input Efficiency	88.0 % at 115 Vac and 89.0 % at 230 Vac
		Input frequency range	47 to 63 Hz
		Input AC current	Max 1.7 A at 90 Vac
	Output	**Output power**	65W
		DC output	19.5V
		Hold-up time	5 ms at 115 Vac input
		Output current limit	<11.0A
	AC Connector (Ac Inlet)	C6 (3pin/with grounded, with Smart ID DC connector)	
	AC Connector (Ac Inlet) Environmental Design	**Operating temperature**	32° to 95° F (0° to 35° C)
		Non-operating (storage) temperature	-4° to 185° F (-20° to 85° C)
		Altitude	0 to 16,400 ft (0 to 5,000 m)
		Humidity	20% to 95%
		Storage Humidity	10% to 95%
	EMI and Safety Certifications	*CE Mark - full compliance with LVD and EMC directives * Worldwide safety standards - IEC60950, EN60950, UL60950, Class1, SELV; Agency approvals - C-UL-US, NORDICS, DENAN, EN55022 Class B, FCC Class B, CISPR22 Class B, CCC, NOM-1 NYCE. * MTBF - over 200,000 hours at 25°C ambient condition.	
HP 65W Smart AC Adapter EM	**Dimensions**	102.0x55.0x30.0mm	
	Weight	unit: 350g +/- 10g	
	Input	90 to 265 VAC	
		Input Efficiency	87.0% min at 115 VAC and 230Vac
		Input frequency range	47 to 63 Hz
		Input AC current	1.7 A at 90 VAC
	Output	**Output power**	**Output**
		DC output	19.5V
		Hold-up time	5 ms at 115 Vac input
		Output current limit	<11.0A
	AC Connector (Ac Inlet)	C6 (3pin/with grounded, with Smart ID DC connector)	
	AC Connector (Ac Inlet) Environmental Design	**Operating temperature**	32° to 95° F (0° to 35° C)

		Non-operating (storage) temperature	-4° to 185° F (-20° to 85° C)
		Altitude	0 to 16,400 ft (0 to 5,000 m)
		Humidity	20% to 95%
		Storage Humidity	10% to 95%
	EMI and Safety Certifications	*CE Mark - full compliance with LVD and EMC directives * Worldwide safety standards - IEC60950, EN60950, UL60950, Class1, SELV; Agency approvals - C-UL-US, NORDICS, DENAN, EN55022 Class B, FCC Class B, CISPR22 Class B, CCC, NOM-1 NYCE. * MTBF - over 200,000 hours at 25°C ambient condition.	

HP 65W Travel AC Adapter Argentina	**Dimensions**	107.0x47.0x30.0mm	
	Weight	unit: 250g +/- 10g	
	Input	90 to 265 VAC	
		Input Efficiency	88.0 % at 115 Vac and 89.0 % at 230 Vac
		Input frequency range	47 to 63 Hz
		Input AC current	Max 1.7 A at 90 Vac
	Output	**Output power**	65W
		DC output	19.5V
		Hold-up time	5 ms at 115 Vac input
		Output current limit	<11.0A
	AC Connector (Ac Inlet)	C6 (3pin/with grounded, with Smart ID DC connector)	
	AC Connector (Ac Inlet) Environmental Design	**Operating temperature**	32° to 95° F (0° to 35° C)
		Non-operating (storage) temperature	-4° to 185° F (-20° to 85° C)
		Altitude	0 to 16,400 ft (0 to 5,000 m)
		Humidity	20% to 95%
		Storage Humidity	10% to 95%
	EMI and Safety Certifications	*CE Mark - full compliance with LVD and EMC directives * Worldwide safety standards - IEC60950, EN60950, UL60950, Class1, SELV; Agency approvals - C-UL-US, NORDICS, DENAN, EN55022 Class B, FCC Class B, CISPR22 Class B, CCC, NOM-1 NYCE. * MTBF - over 200,000 hours at 25°C ambient condition.	

HP 65W Smart USB Type C Adapter	**Dimensions**	74x74x28.5mm	
	Weight	unit: 245g +/- 10g	
	Input	**Input Efficiency**	81.5% min at 115 Vac/ 230Vac @ 5V/3A 86.7% min at 115 Vac/ 230Vac @ 9V/3A 88% min at 115 Vac/ 230Vac @ 10V/5A 88% min at 115 Vac/ 230Vac @ 12V/5A 89% min at 115 Vac/ 230Vac @ 15V/4.33A

			89% min at 115 Vac/ 230Vac @ 20V/3.25A
		Input frequency range	47 to 63 Hz
		Input AC current	Max 1.7 A at 90 Vac
	Output	**Output power**	65W
		DC output	5V/9V/10V/12V/15V/20V
		Hold-up time	5 ms at 115 Vac input
		Output current limit	<8.0A
	Environmental Design	**Operating temperature**	32° to 95° F (0° to 35° C)
		Non-operating (storage) temperature	-4° to 185° F (-20° to 85° C)
		Altitude	0 to 16,400 ft (0 to 5,000 m)
		Humidity	5% to 95%
		Storage Humidity	5% to 95%
	EMI and Safety Certifications	*CE Mark - full compliance with LVD and EMC directives *Worldwide safety standards - IEC60950, EN60950, UL60950, Class1, SELV; Agency approvals - C-UL-US, NORDICS, DENAN, EN55022 Class B, FCC Class B, CISPR22 Class B, CCC, NOM-1 NYCE. *MTBF - over 100,000 hours at 25°C ambient condition.	
HP 65W Travel AC Adapter	**Dimensions**	120.0x57.6x16.7mm	
	Weight	unit: 250g +/- 10g	
	Input	**Input Efficiency**	88.0 % at 115 Vac and 89.0 % at 230Vac
		Input frequency range	47 to 63 Hz
		Input AC current	1.7 A at 90 Vac
	Output	**Output power**	65W
		DC output	19.5V/5V
		Hold-up time	5 ms at 115 Vac input
		Output current limit	<11.0A
	DC Plug	4.5mm/7.4mm tips	
	Environmental Design	**Operating temperature**	32° to 95° F (0° to 35° C)
		Non-operating (storage) temperature	-4° to 185° F (-20° to 85° C)
		Altitude	0 to 16,400 ft (0 to 5,000 m)
		Humidity	20% to 95%
		Storage Humidity	10% to 95%
	EMI and Safety Certifications	*CE Mark - full compliance with LVD and EMC directives * Worldwide safety standards - IEC60950, EN60950, UL60950, Class1, SELV; Agency approvals - C-UL-US, NORDICS, DENAN, EN55022 Class B, FCC Class B, CISPR22 Class B, CCC, NOM-1 NYCE. * MTBF - over 200,000 hours at 25°C ambient condition.	
HP 45W Smart AC Right Angle Adapter	**Dimensions**	3.74 x 1.57 x 1.04 in (9.5 x 4.0 x 2.65 cm)	
	Weight	0.386 lb (175g) max	

	Input	**Input Efficiency**	87.74% at 115Vac and 88.4% at 230Vac
		Input frequency range	47 to 63 Hz
		Input AC current	Max 1.4 A at 90 VAC
	Output	**Output power**	45W
		DC output	19.5V
		Hold-up time	5 ms at 115 Vac input
		Output current limit	<8.0 A
	Environmental Design	**Operating temperature**	32° to 95° F (0° to 35° C)
		Non-operating (storage) temperature	-4° to 185° F (-20° to 85° C)
		Altitude	0 to 16,400 ft (0 to 5,000 m)
		Humidity	5% to 95%
		Storage Humidity	5% to 95%
	EMI and Safety Certifications	*CE Mark - full compliance with LVD and EMC directives * Worldwide safety standards - IEC60950, EN60950, UL60950, Class1, SELV; Agency approvals - C-UL-US, NORDICS, DENAN, EN55022 Class B, FCC Class B, CISPR22 Class B, CCC, NOM-1 NYCE. * MTBF - over 200,000 hours at 25°C ambient condition.	
HP 45W Smart AC Adapter (2 Prong)	**Dimensions** (H x W x D)	95.0x40.0x26.5mm	
	Weight	unit: 200g +/- 10g	
	Input	90 to 265 VAC	
		Input Efficiency	87.74% at 115Vac and 88.4% at 230Vac
		Input frequency range	47 to 63 Hz
		Input AC current	Max. 1.4 A at 90 Vac
	Output	**Output power**	45W
		DC output	19.5V
		Hold-up time	5 ms at 115 Vac input
		Output current limit	<8.0A
	AC Connector (Ac Inlet)	C8 (2 pin/non-grounded, with Smart ID DC connector)	
	Environmental Design	**Operating temperature**	32° to 95° F (0° to 35° C)
		Non-operating (storage) temperature	-4° to 185° F (-20° to 85° C)
		Altitude	0 to 16,400 ft (0 to 5,000 m)
		Humidity	20% to 95%
		Storage Humidity	10% to 95%
	EMI and Safety Certifications	*CE Mark - full compliance with LVD and EMC directives * Worldwide safety standards - IEC60950, EN60950, UL60950, Class1, SELV; Agency approvals - C-UL-US, NORDICS, DENAN, EN55022 Class B, FCC Class B, CISPR22 Class B, CCC, NOM-1 NYCE. * MTBF - over 200,000 hours at 25°C ambient condition.	
HP 45W Smart AC Right Angle Adapter Argentina	**Dimensions**	3.74 x 1.57 x 1.04 in (9.5 x 4.0 x 2.65 cm)	
	Weight	0.386 lb (175g) max	
	Input	**Input Efficiency**	87.74% at 115Vac and 88.4% at 230Vac

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

		Input frequency range	47 to 63 Hz
		Input AC current	Max 1.4 A at 90 VAC
	Output	**Output power**	45W
		DC output	19.5V
		Hold-up time	5 ms at 115 Vac input
		Output current limit	<8.0 A
	Environmental Design	**Operating temperature**	32° to 95° F (0° to 35° C)
		Non-operating (storage) temperature	-4° to 185° F (-20° to 85° C)
		Altitude	0 to 16,400 ft (0 to 5,000 m)
		Humidity	5% to 95%
		Storage Humidity	5% to 95%
	EMI and Safety Certifications	*CE Mark - full compliance with LVD and EMC directives *Worldwide safety standards - IEC60950, EN60950, UL60950, Class1, SELV; Agency approvals - C-UL-US, NORDICS, DENAN, EN55022 Class B, FCC Class B, CISPR22 Class B, CCC, NOM-1 NYCE. *MTBF - over 200,000 hours at 25°C ambient condition.	
HP 45W Smart USB Type C Adapter	**Dimensions**	62.0x62.0x28.5mm	
	Weight	unit: 220g +/- 10g	
	Input	**Input Efficiency**	Average Efficiency of 25%, 50%, 75%, 100% load condition with 115Vac/230Vac Spec: 5V : 81.5% 9V : 86.7% 10V : 87.5% 12V : 87.8% 15V : 87.8% 20V : 87.8%
		Input frequency range	47 to 63 Hz
		Input AC current	Max 1.4 A at 90 Vac
	Output	**Output power**	45W
		DC output	5V/15W; 9V/27W; 10V/37.5W; 12V/45W; 15V/45W; 20V/45W
		Hold-up time	5 ms at 115 Vac input
		Output current limit	<5.0A
	Environmental Design	**Operating temperature**	32° to 95° F (0° to 35° C)
		Non-operating (storage) temperature	-4° to 185° F (-20° to 85° C)
		Altitude	0 to 16,400 ft (0 to 5,000 m)
		Humidity	5% to 95%
		Storage Humidity	5% to 95%
	EMI and Safety Certifications	*CE Mark - full compliance with LVD and EMC directives * Worldwide safety standards - IEC60950, EN60950, UL60950, Class1, SELV; Agency approvals - C-UL-US, NORDICS, DENAN, EN55022 Class B, FCC Class B, CISPR22 Class B, CCC, NOM-1 NYCE. * MTBF - over 200,000 hours at 25°C ambient condition.	

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

HP Long Life 3-cell Polymer Battery (56WHr)	**Dimensions (H x W x L)**	7.15mm x 79.65mm x 281.7mm	
	Weight	219 g +/- 10g	
	Cells/Type	3cell Lithium-Ion Polymer cell / P615383A1	
	Energy	Voltage	11.55V
		Amp-hour capacity	4.610Ah/4.850Ah
		Watt-hour capacity	56whr
	Temperature	Operating (Charging)	32° to 122° F (0° to 50° C)
		Operating (Discharging)	14° to 140° F (-10° to 60° C)
	Fuel Gauge LED	No	
	Warranty	3-year	
	Optional Travel Battery Available	No	

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®
- EPEAT™ Gold registered in the United States. See http://www.epeat.net for registration status in your country. Search keyword *generator* on HP's 3rd party option store for solar energy accessory at http://www.hp.com/go/options.

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, 60Hz**
Normal Operation (Short idle)	9.06 W	9.98 W	9.6 W
Normal Operation (Long idle)	7.31 W	7.82 W	8.0 W
Sleep	0.76 W	0.89 W	0.75 W
Off	0.44 W	0.56 W	0.43 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, 60Hz**
Normal Operation (Short idle)	31 BTU/hr	34 BTU/hr	33 BTU/hr
Normal Operation (Long idle)	25 BTU/hr	27 BTU/hr	27 BTU/hr
Sleep	3 BTU/hr	3 BTU/hr	3 BTU/hr
Off	2 BTU/hr	2 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	2.9	20
Fixed Disk – Random writes	2.9	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
- 1 PC card slot (type I/II)
- 1 ExpressCard/54 slot
- 1 IEEE 1394 Port
- 2 SODIMM memory slots
- Optional expansion base docking station
- 1 multi-bay II storage port
- Interchangeable HDD??

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

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 the1ppm by weight
Cadmium greater than 20ppm by weight

Battery description: CR2032 (coin cell)
Battery type: Lithium

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 9.0% post-consumer recycled plastic (by wt.)
- This product is 96.9% recycle-able when properly disposed of at end of life.
-

Packaging Materials

External:	PAPER/Corrugated	345 g
Internal:	PLASTIC/Polyethylene Expanded - EPE	4 g
	PLASTIC/Polypropylene - PP	76 g
	PLASTIC/Polyethylene low density - LDPE	15 g

The plastic packaging material contains at least 50% recycled content.
The corrugated paper packaging materials contains at least 70% 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
- 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)

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

- Polybrominated Biphenyl Oxides (PBBOs)
- Polychlorinated Biphenyl (PCB)
- Polychlorinated Terphenyls (PCT)
- Polyvinyl Chloride (PVC) – except for wires and cables, 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

Hewlett-Packard 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 Hewlett Packard 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://www.hp.com/hpinfo/globalcitizenship/environment/pdf/PC_GBU_Product_Design_ISO_14K_Certificate.pdf

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 #
Memory	HP 4GB DDR4-2400 SODIMM (Core processors only)	Z4Y84AA
	HP 16GB DDR4-2400 SODIMM (Core processors only)	Z4Y86AA
Cases	HP 15.6 Business Top Load– Refresh	2SC66AA
	HP USB-C Universal Dock	1MK33AA#xxx
Docking	HP USB-C Mini Dock	1PM64AA#xxx
	HP USB-C Universal Dock w/4.5mm Adapter	2UF95AA
	HP Thunderbolt Dock 120W G2	2UK37AA
	HP Thunderbolt Dock 120W G2 TAA	2UK37AA
Input/Output - Mice	HP TB Dock G2 w/Combo Cable	3TR87AA#xxx
	HP TB Docks 120W G2 w/Audio	3YE87AA#xxx
	HP Ultra Slim Docking Station	D9Y32AA#xxx
	HP Travel Hub	T0K30AA
	HP Comfort Grip Mouse	H2L63AA
	HP 3-Button Laser Mouse	H4B81AA#xxx
	HP X4000 Bluetooth Mouse	H3T50AA#xxx
	HP Slim Bluetooth Mouse	F3J92AA#xxx
	HP USB Travel Mouse	G1K28AA#xxx
Battery Adapters	HP Slim Wireless Keyboard and Mouse	T6L04AA#xxx
	HP Slim USB Keyboard and Mouse	T6T83AA
	HP Wireless (Link-5) Keyboard	T6U20AA#xxx
	HP 65W Smart AC Adapter	H6Y89AA
	HP 90W Smart AC Adapter	H6Y90AA
	HP 150W Slim Smart AC Adapter	TBD
	HP TA03XL Rechargeable Battery	1FN06AA
	HP USB-C™ to VGA Adapter	N9K76AA
	HP USB-C to USB Hub	Z6A00AA
	HP HDMI to DVI adapter	F5A28AA
	DisplayPort™ to DVI Adapter	F7W96AA
	DisplayPort™ to VGA	F7W97AA
	DisplayPort™ to HDMI 1.4 Adapter	F3W43AA
Wireless Collaboration	HP lt4120 LTE/EVDO/HSPA+ Gobi™ 4G Mobile Broadband Module	TBD
	HP UC Conferencing Keyboard	K8P74AA#xxx
	HP USB Collaboration Keyboard	Z9N38AA
	HP Stereo 3.5mm Headset	T1A66AA
	HP Stereo USB Headset	T1A67AA
Storage - External Storage	HP External USB DVDRW Drive	F2B56AA
	HP 500GB 7200rpm HDD	F3B97AA
	HP External USB DVDRW Drive	F2B56AA
	HP 500GB 7200rpm HDD	F3B97AA
	HP 256GB M2 NVME PCIe SSD (2280)	V3K66AA
	HP 512GB M2 NVME PCIe SSD (2280)	V3K67AA
	HP Dual Head Cable Lock (Non-Master key)	T1A64AA
Security	HP Dual Head Cable Lock (Master Key)	T1A65AA

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

Memory	HP 15.6" Notebook PC Privacy Filter (non-touch)	J7H71AA
	HP Docking Station Cable Lock	AU656AA#XXX
	HP Essential Combination Lock	T0Y16AA
	HP Combination Lock	T0Y15AA
	HP Keyed Cable Lock	T0Y14AA
	HP 15'6 Privacy Filter (touch panel)	V8Z58AA#xxx
	HP 4GB DDR4-2400 SODIMM (Core processors only)	Z4Y84AA
	HP 16GB DDR4-2400 SODIMM (Core processors only)	Z4Y86AA
	HP 15.6 Business Top Load– Refresh	2SC66AA
Cases	HP USB-C Universal Dock	1MK33AA#xxx
Docking	HP USB-C Mini Dock	1PM64AA#xxx
	HP USB-C Universal Dock w/4.5mm Adapter	2UF95AA
	HP Thunderbolt Dock 120W G2	2UK37AA
	HP Thunderbolt Dock 120W G2 TAA	2UK37AA
	HP TB Dock G2 w/Combo Cable	3TR87AA#xxx
Input/Output - Mice	HP TB Docks 120W G2 w/Audio	3YE87AA#xxx
	HP Ultra Slim Docking Station	D9Y32AA#xxx
	HP Travel Hub	T0K30AA
	HP Comfort Grip Mouse	H2L63AA
	HP 3-Button Laser Mouse	H4B81AA#xxx
	HP X4000 Bluetooth Mouse	H3T50AA#xxx
	HP Slim Bluetooth Mouse	F3J92AA#xxx
	HP USB Travel Mouse	G1K28AA#xxx
	HP Slim Wireless Keyboard and Mouse	T6L04AA#xxx
	HP Slim USB Keyboard and Mouse	T6T83AA
	HP Wireless (Link-5) Keyboard	T6U20AA#xxx
	HP 65W Smart AC Adapter	H6Y89AA
	HP 90W Smart AC Adapter	H6Y90AA
Battery Adapters	HP 150W Slim Smart AC Adapter	TBD
	HP TA03XL Rechargeable Battery	1FN06AA
	HP USB-C™ to VGA Adapter	N9K76AA
	HP USB-C to USB Hub	Z6A00AA
	HP HDMI to DVI adapter	F5A28AA
	DisplayPort™ to DVI Adapter	F7W96AA
	(for 1 year platforms)	UC282E
Care Packs	(for 3 year platforms)	UC279E
	(for 3 year platforms)	UC279E

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:**
February 15, 2018	From v1 to v2	Changed	Environmental data updated
February 23, 2018	From v2 to v3	Added	Dock, case, mouse, adapter, display and care packs added to options section
March 1, 2018	From v3 to v4	Added	Battery note on power supply section
May 24, 2018	From v4 to v5	Changed	Format
August 20, 2018	From v5 to v6	Changed	General update
August 27, 2018	From v6 to v7	Changed	Format
October 17, 2018	From v7 to v8	Changed	Format
November 26, 2018	From v8 to v9	Changed	Multi-display section