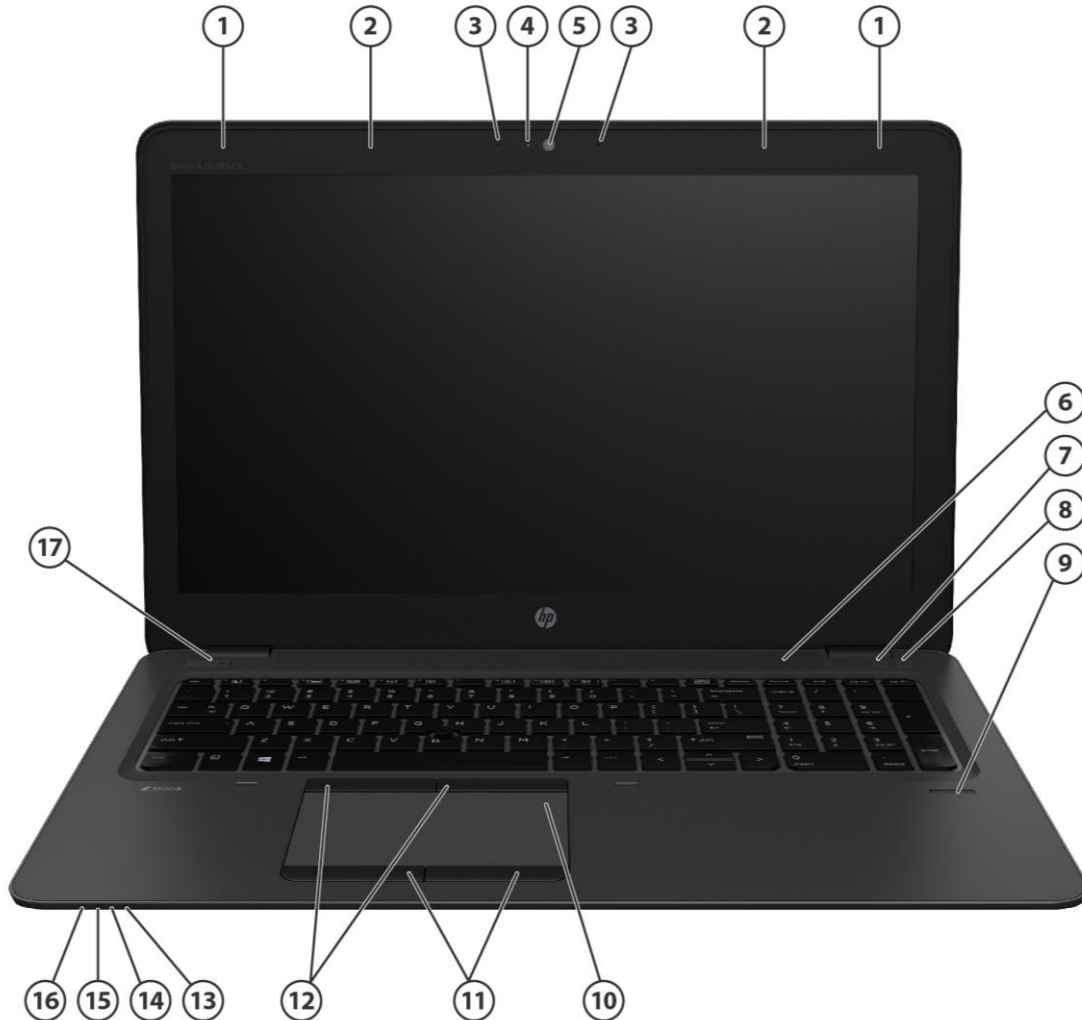


Overview

HP ZBook 15u G4 Mobile Workstation



1. Wireless LAN antennas
2. WWAN antennas (selected products only)
3. Internal microphones (2)
4. Webcam light
5. Webcam
6. Speakers
7. Wireless On/Off button
8. Volume mute button
9. Fingerprint reader (select models only)

Front

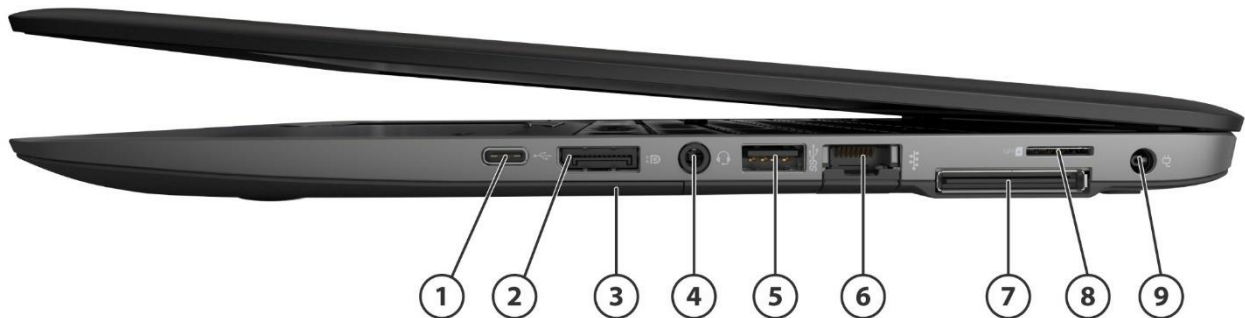
10. Touchpad
11. Lower Touchpad buttons (right and left click buttons)
12. Upper Touchpad buttons (right and left click buttons)
13. Storage light indicator
14. Battery light indicator
15. Power light indicator
16. Wireless light indicator
17. Power button

Overview



Left

1. Security lock slot
2. VGA port
3. USB 3.0 port (charging)
4. Smart Card reader



Right

1. USB 3.1 (Gen 1)
2. DisplayPort™
3. SD Card Reader
4. Headphone/Microphone Combo Jack
5. USB 3.0 port
6. RJ-45 / Ethernet
7. Side Docking connector
8. SIM Module Slot
9. Power connector

Overview

At A Glance

- Windows® 10 editions, or FreeDOS
- Value performance form factor and thinner industrial design than previous generation workstation grade products.
- Thin & light value performance industrial design, Casted magnesium-reinforced chassis, top cover frame features soft touch paint with lightweight aluminum insert anodized in HP's new "Space Silver" color with chemical etching. Backlight keyboard in full aluminum deck with magnesium bottom reinforcement, chemically strengthened glass touchpad, and updated system functions indicators. HP Spill Resistant Keyboard with Durakeys, touchpad buttons with Duracoat finish.
- Designed to pass military standard MIL-STD-810G testing*.
- Workstation-caliber AMD FirePro™ discrete graphics: AMD FirePro™ W4190M (2 GB dedicated GDDR5); AMD Enduro™ graphics technology.
- ISV certified to provide fast and reliable performance with workstation applications, including manipulation of 3D textures
- Choice of 7th generation Intel® Core™ i7 and i5 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, for system memory up to 32GB
- Supports up to 3 independent displays via internal LCD Panel, system DisplayPort™, system VGA, or using the HP UltraSlim Docking Station DisplayPort™ and VGA ports (sold separately). Supports DisplayPort™ 1.2 monitors.
- 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
- 3-cell (51 WHr) HP Long Life Battery
- 2 discrete buttons with LED indicator for convenient one touch access: Wireless On/Off, Volume Mute
- Widescreen 15-inch diagonal anti-glare LED-backlit display:
- FHD (1920x1080) standard viewing angle, FHD (1920x1080) ultrawide viewing angle, UHD (3840x2160) ultrawide viewing angle, or FHD Touch (1920x1080) standard viewing angle
- Supports wireless LAN and wireless WAN options for connectivity on the go.
- Two dedicated drive slots. (1) M.2 slots and (1) 2.5" drive bay. Both can be populated at the same time.
- Security features including HP Client Security Manager, with central management
- Low halogen, ENERGY STAR® certified and EPEAT® TBD registered in the U.S. EPEAT® status varies by country- please see epeat.net.
- HP BIOS self-healing technology including HP Sure Start to prevent, detect, and remedy known and unknown BIOS attacks.

* 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.

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

Features

OPERATING SYSTEM

Preinstalled OS Windows® 10 Pro 64*
Windows® 10 Home Single Language 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 Kaby Lake, Apollo Lake, Bristol Ridge 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 (2.8 GHz, 4 MB cache, 2 cores) * Up to 3.9 GHz with Intel® Turbo Boost Technology
7th Generation Intel® Core™ i7 7500U (2.7 GHz, 4 MB cache, 2 cores) * Up to 3.5 GHz with Intel® Turbo Boost Technology
7th Generation Intel® Core™ i5 7300U (2.6 GHz, 3 MB cache, 2 cores) * Up to 3.5 GHz with Intel® Turbo Boost Technology
7th Generation Intel® Core™ i5 7200U (2.5 GHz, 3 MB cache, 2 cores) * Up to 3.1 GHz with Intel® Turbo Boost Technology

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

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

Features

CHIPSET

Non-applicable, processor specific

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® Centrino® WLAN module and a preinstalled Windows operating system. It provides advances in remote manageability, security, energy efficient performance, and wireless connectivity. Intel Active Management Technology (iAMT) offers built-in manageability and proactive security for networked mobile workstations, even when they are powered off* or when the operating system is inoperable. It can help identify threats before they reach the network, isolate infected systems, and update 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*

AMD FirePro™ W4190M (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

** Supports up to 3 independent displays via internal LCD Panel, system DisplayPort™, system VGA, or using the HP UltraSlim Docking Station DisplayPort™ and VGA ports (sold separately).

DISPLAY

Internal

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

15.6" diagonal LED backlit FHD SVA eDP anti-glare (1920 x 1080);

15.6" diagonal LED UHD UWVA IPS anti-glare (3840 x 2160)

15.6" diagonal Touch LED-backlit FHD SVA (1920 x 1080)

External

Up to 30-bit (2³⁰) per pixel "Deep Color"

(total of 1,073,741,824 color variations)

VGA

Port supports resolutions up to 1920 x 1200 at 60 Hz, and lower resolutions up to 75 Hz.

Features

DisplayPort™ w/MST (Multi-stream Transport)

Supports resolutions up to UHD 3840 x 2160, 24/30-bit color depth at 60 Hz, and WUXGA (1920 x 1200) monitors, with 24/30-bit color depth up to 120 Hz.

DisplayPort™ Features

- Multi-stream Transport (MST): Multi-stream Transport is a DisplayPort™ 1.2 feature that allows daisy chaining of DisplayPort™ 1.2 monitors (requires monitor with DisplayPort™ 1.2 MST capability), or the use of DisplayPort™ 1.2 hubs with MST to achieve a maximum of 3 active displays.

DVI-D (single link)

DVI support requires a DP-to-DVI adapter (sold separately). Dual-Link DVI is supported with an active USB powered adapter (sold separately).

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

STORAGE AND DRIVES

Primary Storage Bay

SATA, 2.5" Hard Drive*

1 TB 5400 rpm Hard Drive
500 GB 7200 rpm Hard Drive
500 GB 7200 rpm Self Encrypting Drive (Opal2)
500 GB 7200 rpm Self Encrypting Drive FIPS 140-2 compliant
500 GB 5400 rpm Hybrid Drive (8 GB cache)

M.2 SATA SED SSD

256 GB SATA-3 Self-Encrypting (Opal 2) MLC Solid State Drive
512GB SATA-3 SS TLC SSD FIPS-140-2

HP Z Turbo Drive (NVMe PCIe SSD)

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

HP 3D DriveGuard (Windows only)

The hard drive is mounted directly to the notebook frame, reducing the transmission of shock to the hard drive.

NOTE: For Solid State Drives or Hard Drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 30 GB (and 10) is reserved for system recovery software.

Features

DRIVE CONTROLLERS

| | |
|---|-----------------------------------|
| 2.5" Storage Bays and M.2 Storage Bay (SATA): | SATA-3 for HDD and SATA-3 for SSD |
| HP Z Turbo Drive: | PCIe NVMe SSD |
| RAID: | Not supported |

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

MEMORY

Standard

32 GB DDR4 1.2V Non ECC SDRAM (Transfer rates up to 2133MT/s)
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

Integrated Intel® I219-LM Gigabit* Network Connection (vPro configurations)
Intel® I219-V 10/100/1000 Ethernet (non-vPro configurations)

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 a/b/g/n/ac (2x2) WiFi + Bluetooth 4.2 Combo Adaptor* (vPro)
Intel® Dual Band Wireless-AC 8265 802.11 a/b/g/n/ac (2x2) WiFi + Bluetooth 4.2 Combo Adaptor* (non-vPro)
Intel® Dual Band Wireless-AC 3168 802.11 ac (1x1) WiFi and Bluetooth 4.2 Combo Adapter (non-vPro)

Wireless WAN - Mobile Broadband **

HP It4132 LTE/HSPA+ 4G Mobile Broadband Module
HP hs3210 HSPA+ Mobile Broadband Module

Features

HP It4120 Qualcomm® Snapdragon™ X5 LTE Mobile Broadband Module

Near Field Communications (NFC)

HP Module with NXP NFC Controller NPC100

* 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.

AUDIO/MULTIMEDIA

Audio

Bang and Olufsen audio

Integrated stereo speakers

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

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

Combo mic-in / stereo headphone-out jack

Webcam

720p HD webcam*

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

* HD content required to view HD images.

KEYBOARDS/POINTING DEVICES/BUTTONS & FUNCTION KEYS

Keyboard

Optional backlit keyboard with Function key control to toggle backlit brightness setting - off/full/half brightness

The HP spill-resistant keyboard is designed using a thin layer of Mylar film under the keyboard and a drain system that funnels fluid through a hole in the bottom of the notebook. This minimizes the risk of damage to sensitive components underneath. The 100-key compatible keyboard features a full-pitch key layout with desktop keyboard features, such as editing keys, both left and right control and alt keys, function keys, and 18.0 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

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

Point stick with two additional point stick buttons

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

Buttons and Function Keys

Separate launch buttons provide easy access to the following features: wireless on/off, volume mute. Function keys provide

Features

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

SOFTWARE AND SECURITY

Preinstalled Software with Windows Operating System

BIOS

HP BIOSphere¹
HP Sure Start Gen3
HP DriveLock¹² | HP Automatic DriveLock
BIOS Update via Network
Master Boot Record Security
Power On Authentication
Secure Erase²
Absolute Persistence Module³
Pre-boot Authentication

Communication

HP Mobile Connect Pro (Windows 8.1 and Windows 10 only)⁴
Native Miracast Support⁵
HP MAC Address Manager

HP Value Add Software

HP 3D DriveGuard
HP ePrint Driver + JetAdvantage⁶
HP Hotkey Support
HP Recovery Manager¹¹
HP Jumpstart
HP Support Assistant
HP Noise Cancellation Software
HP Performance Advisor
HP Remote Graphics Software
HP Velocity

Microsoft Products

Buy Office
Bing Search
Skype⁷

Manageability

HP Driver Packs¹¹
HP SoftPaq Download Manager (SDM)
HP System Software Manager (SSM)⁸
HP BIOS Config Utility (BCU)⁸
HP Client Catalog⁸
HP Manageability Integration Kit for Microsoft SCCM⁸
HP Image Assistant⁸
LANDESK Management⁹

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

Client Security Software

- HP Client Security Suite Gen 3

Features

- HP Security Manager (including Credential Manager and Password Manager)
- HP Drive Lock
- HP Fingerprint Sensor
- HP Password Manager
- Absolute Persistence Module
- Power On Authentication
- Microsoft Defender¹³

Standard

Trusted Platform Module (TPM) 1.2 Embedded Security Chip (Common Criteria EAL4+ Certified). Field upgradeable to TPM 2.0¹⁰

HP Fingerprint Reader

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

1. Available only on business PCs with HP BIOS.
2. For the methods outlined in the National Institute of Standards and Technology Special Publication 800-88.
3. 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.
4. HP Mobile Connect Pro is only available on preconfigured devices with WWAN. For geographic availability refer to <http://www.hp.com/go/mobileconnect>
5. 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>
6. Requires an Internet connection to HP web-enabled printer and HP ePrint account registration (for a list of eligible printers, supported documents and image types and other HP ePrint details, see <http://www.hp.com/go/eprintcenter>). Requires optional broadband module. Broadband use requires separately purchased service contract. Check with service provider for coverage and availability in your area. Separately purchased data plans or usage fees may apply. Print times and connection speeds may vary.
7. Skype is not offered in China.
8. Not preinstalled, however available for download at <http://www.hp.com/go/clientmanagement>
9. Subscription required.
10. This product ships with TPM 1.2 with option to upgrade to TPM 2.0. Upgrade utility is expected to be available by the end of 2015 via HP Customer Support
11. Models shipped with Windows 7 include HP Recovery Manager. HP Recovery Manager enables fast recovery of the factory preinstalled image if the system becomes corrupted or if important system files are accidentally deleted. Up to 36 GB (for Windows 7) of system and up to 36 GB (for Windows 10) disk is reserved for system recovery software
12. DriveLock feature only supported with SATA drives. DriveLock feature not supported on HP Z Turbo Drive PCIe SSDs.
13. Opt in and internet connection required for updates

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

Features

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

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

Security

See Software section above.

Other Standard Security Features

Integrated Smart Card Reader

One-Step Logon

Security lock slot

Support for Intel® AT

Optional Security Features

HP Fingerprint Sensor (optional)

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

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

HP CENTRAL MANAGEMENT

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

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

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

An optional fingerprint reader and integrated Smart Card Reader help keep your identity secure. The security cable slot helps keep your notebook physically secure.

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

Features

POWER

Power Supply

HP 65W Slim Smart AC Adapter

Primary Battery

HP 3-cell Long Life Polymer Battery (51 Whr)

Battery Life

Battery life up to 12 hours 14 minutes (with 51Whr battery, FHD panel, SATA SSD, AMD W4190M, Hybrid graphics)*

System Standby Time

Up to TBD weeks**

*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® Enduro™ Technology

Hibernation

Standby

ACPI compliance

ENVIRONMENTAL

US ENERGY STAR®

IT ECO declaration

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

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

Weight

Starting at 4.18 lb. (1.9 kg)

Dimensions (w x d x h)

15.09 x 10.1 x 0.79 in

383.3 x 257.7 x 19.9 mm

NOTE: Height varies depending upon where on the notebook the measurement is made. Weight varies by configuration and components. Weight includes 3 cell 46Whr battery, without hard drive and with 256 GB Z Turbo Drive (PCIe SSD).

Features

PORTS/SLOTS

Ports

Left side:

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

Right side:

- (1) USB 3.1 Gen 1
- (1) USB 3.0 Port
- (1) DisplayPort™ 1.2
- (1) Headphone/Microphone Combo
- (1) RJ-45 / Ethernet
- (1) Side Docking connector
- (1) Power connector

Digital Media Slots

- (1) SD UHS-II Flash Media slot – Supports next generation SD (Secure Digital), backward compatible to SDHC, SDXC
 - (1) Integrated Smart Card Reader (Compatible with ISO 7816 compliant Smart Cards PC/SC interface support)
-

SERVICE AND SUPPORT

Limited 3-year or 1-year limited warranty options available, depending on country. Batteries have a default one year limited warranty except for Long Life batteries which will have same 1-year or 3-year limited warranty as the platform. Optional¹ HP Care Pack Services are extended service contracts which go beyond your standard limited warranties. To choose the right level of service for your HP product, use the HP Care Pack Services Lookup Tool at <http://www.hp.com/go/cpc>.

Sold separately or as an optional feature.

1. 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 | AMD FirePro™ Graphics | Windows® 7 (32-bit) 16.28 W | Windows® 7 (64-bit) 16.8 W |
| Temperature | Max Operating Power | < 65 W | | |
| | Operating | 32° to 95° F (0° to 35° C) (not writing optical) 41° to 95° F (5° to 35° C) (writing optical) | | |
| Relative Humidity | Non-operating | -4° to 140° F (-20° to 60° C) | | |
| | Operating | 10% to 90%, non-condensing | | |
| Shock | Non-operating | 5% to 95%, 101.6° F (38.7° C) maximum wet bulb temperature | | |
| | Operating | 40 G, 2 ms, half-sine | | |
| Random Vibration | Non-operating | 200 G, 2 ms, half-sine | | |
| | Operating | 0.75 grms | | |
| Altitude (unpressurized) | Non-operating | 1.50 grms | | |
| | Operating | -50 to 10,000 ft. (-15.24 to 3,048 m) | | |
| Planned Industry Standard Certifications | Non-operating | -50 to 15,000 ft. (-15.24 to 12,192 m) | | |
| | UL | Yes | | |
| | CSA | Yes | | |
| | FCC Compliance | Yes | | |
| | ENERGY STAR® | Select models* | | |
| | EPEAT® | Gold target** | | |
| | ICES | Yes | | |
| | Australia / NZ A-Tick Compliance | Yes | | |
| | CCC | Yes | | |
| | Japan VCCI Compliance | Yes | | |
| | KCC | Yes | | |
| BSMI | Yes | | | |
| CE Marking Compliance | Yes | | | |
| MIL STD*** | Planned | | | |

* Configurations of the HP ZBook 15u G3 that are ENERGY STAR® certified are identified as HP ZBook 15u G3 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 UWVA IPS eDP anti-glare + Panel Self Refresh (PSR) (1920 x 1080)

| | |
|---------------------------|---------------------------------|
| Dimensions (W x H) | 360 x 224.3 (mm) max |
| Active Area | 344.2 x 193.5 (mm) |
| Weight | 360g (max) |
| Surface Treatment | Anti-glare |
| Contrast Ratio | 600:1 (typical) |
| Refresh Rate | 60 Hz |
| Brightness | 300 nit (typical) |
| Pixel Resolution | Format 1920 x 1080 (FHD) |
| | Configuration RGB Stripe |
| Backlight | LED |
| PPI | 142 |
| Viewing Angle | UWVA 85/85/85/85 |

15.6" diagonal LED backlight FHD eDP SVA Anti-glare (1920 x 1080)

| | |
|---------------------------------------|---------------------------------|
| Outline Dimensions (W x H x D) | 360 x 224.3 (mm) max |
| Active Area | 344.2 x 193.5 (mm) |
| Weight | 360 g max. |
| Diagonal Size | 15.6" (inch) |
| Surface Treatment | Anti-Glare (AG) |
| Contrast Ratio | 400:1 (typical) |
| Refresh Rate | 60Hz |
| Brightness | 300nits |
| Pixel Resolution | Format 1920 x 1080 (FHD) |
| | Configuration RGB |
| Interface | eDP 1.2 (2 lane) |
| LCD Mode | TN |
| PPI | 142 |
| Viewing Angle | SVA 45/45/25/35 |

15.6" diagonal LED backlight FHD Slim DP SVA (1920 x 1080) Touch with Camera

| | |
|---------------------------------------|---------------------------------|
| Outline Dimensions (W x H x D) | 360 x 224.3 (mm) max |
| Active Area | 344.2 x 193.5 (mm) |
| Weight | 430 g. |
| Diagonal Size | 15.6" |
| Surface Treatment | Anti-smudge/fingerprint coating |
| Contrast Ratio | 400:1 (typical) |
| Touch Enabled | Yes |
| TSP Type | Capacitive |
| Refresh Rate | 60Hz |
| Brightness | 300nits |

Technical Specifications – Displays

| | | | |
|--|----------------------------|----------------------|-------------------|
| 15.6-inch UHD UWVA IPS LED anti-glare (3840 x 2160) | Pixel Resolution | Format | 1920 x 1080 (FHD) |
| | Interface | Configuration | RGB Stripe |
| | LCD Mode | eDP 1.2 | |
| | PPI | TN | |
| | Viewing Angle | 142 | |
| | Active Area (W x H) | SVA 45/45/25/35 | |
| | Dimensions (W x H) | 345.6 x 194.4 (mm) | |
| | Weight | 15.6 in | |
| | Surface Treatment | 560 g | |
| | Contrast Ratio | Anti-Glare (AG) | |
| | Refresh Rate | 1000:1 (typical) | |
| | Brightness | 60 Hz | |
| | Pixel Resolution | 340 nits typical | 1920 x 1080 (FHD) |
| Backlight | Format | RGB | |
| PPI | LED | | |
| Viewing Angle | 282 | | |
| | UWVA 85/85/85/85 | | |

Technical Specifications – Storage

STORAGE AND DRIVES*

| | | | |
|---|--|--|------------------|
| 500 GB 5400rpm Self Encrypting Drive (FIPS-140-2) (Opal 2) | Drive Weight | 0.21 lbs (95 g) | |
| | Capacity | 500 GB | |
| | Height | 0.28 in (7 mm) | |
| | Width | 2.75 in (69.85 mm) | |
| | Interface | ATA-8, SATA 3.0 | |
| | Transfer Rate | Synchronous (maximum) 600 MB/s | |
| | Seek Time (typical reads, including settling) | Single Track | 1.5 ms |
| | | Average | 12ms |
| | | Maximum | 21ms |
| | Cache | 32MB | |
| | Rotational Speed | 7200 rpm | |
| | Logical Blocks | 976,773,168 | |
| | Operating Temperature | 32° to 140° F (0° to 60° C) [top cover temp] | |
| Features | ATA Security; TCG Opal 2.x, FIPS, S.M.A.R.T., NCQ, Ultra DMA | | |
| 500 GB 7200rpm Hard Drive | Drive Weight | 0.20 lbs (92 g)-0.21 lbs (95 g) | |
| | Capacity | 500 GB | |
| | Height | 0.28 in (7 mm) | |
| | Width | 2.75 in (69.85 mm) | |
| | Interface | ATA-8, SATA 3.0 | |
| | Transfer Rate | Synchronous (maximum) 600 MB/s | |
| | Seek Time (typical reads, including settling) | Single Track | 1.5 ms ~ -2.0 ms |
| | | Average | 11 ms ~- 13 ms |
| | | Maximum | 18 ms ~ -22 ms |
| | Cache | 32MB | |
| | Rotational Speed | 7200 rpm | |
| | Logical Blocks | 976,773,168 | |
| | Operating Temperature | 32° to 140° F (0° to 60° C) [case temp] | |
| Features | ATA Security, S.M.A.R.T., NCQ, Ultra DMA | | |
| 500 GB 7200rpm Self-Encrypting Drive (Opal 2) | Drive Weight | 0.21 lbs (95 g) | |
| | Capacity | 500 GB | |
| | Height | 0.28 in (7 mm) | |
| | Width | 2.75 in (69.85 mm) | |
| | Interface | ATA-8, SATA 3.0 | |
| | Transfer Rate | Synchronous (maximum) 600 MB/s | |
| | Seek Time (typical reads, including settling) | Single Track | 1.5ms |
| | | Average | 12ms |
| | | Maximum | 21ms |
| | Cache | 32MB | |
| | Rotational Speed | 7200rpm | |
| | Logical Blocks | 976,773,168 | |
| | Operating Temperature | 32° to 140° F (0° to 60° C) [top cover temp] | |
| Features | ATA Security; TCG Opal 2.x, S.M.A.R.T., NCQ, Ultra DMA | | |
| 1 TB 5400rpm Hard Drive | Drive Weight | 0.21 lbs (94 g)- 0.21 lbs (95 g) | |

Technical Specifications – Storage

| | | | | |
|---|--|--|---------------------------------|--|
| | Capacity | 1 TB | | |
| | Height | 0.28 in (7 mm) | | |
| | Width | 2.75 in (69.85 mm) | | |
| | Interface | ATA-8, SATA 3.0 | | |
| | Transfer Rate | Synchronous (maximum) 600 MB/s | | |
| | Seek Time | Single Track 2ms | | |
| | (typical reads, including settling) | Average 12ms-13ms | | |
| | | Maximum 18ms-22ms | | |
| | Cache | Up to 32MB | | |
| | Rotational Speed | 5400rpm | | |
| | Logical Blocks | 1,953,525,168 | | |
| | Operating Temperature | 32° to 140° F (0° to 60° C) [case temp] | | |
| | Features | ATA Security, S.M.A.R.T., NCQ, Ultra DMA | | |
| 500 GB Hybrid, 8 GB cache | Drive Weight | 0.20 lbs (92 g) ~ 0.21 lbs (95 g) | | |
| | Capacity | 500 GB | | |
| | Height | 0.28 in (7 mm) | | |
| | Width | 2.75 in (69.85 mm) | | |
| | Interface | ATA-8, SATA 3.0 | | |
| | Transfer Rate | Synchronous (maximum) 600 MB/s | | |
| | Seek Time | Single Track 2 ms | | |
| | (typical reads, including settling) | Average 12 ms | | |
| | | Maximum 22 ms | | |
| | Cache | 64MB | | |
| | Rotational Speed | 5400 rpm | | |
| | Logical Blocks | 976,773,168 | | |
| | Operating Temperature | 32° to 140° F (0° to 60° C) [case temp] | | |
| Features | ATA Security, S.M.A.R.T., NCQ, Ultra DMAATA Security | | | |
| 256 GB M2 2280 SATA-3 Self-Encrypting Drive (Opal 2) TLC Solid State Drive | Drive Weight | 0.02 lb (10 g) | | |
| | Capacity | 256 GB | | |
| | Height | 0.09 in (2.23 mm) | | |
| | Width | 0.87 in (22 mm) | | |
| | Interface | ATA-8, SATA 3.0 | | |
| | Performance | Maximum Sequential Read | Maximum Sequential Write | |
| | | Up to 530 MB/s | UP to 515 MB/s | |
| | Logical Blocks | 500,118,192 | | |
| | Operating Temperature | 32° to 158°F (0° to 70°C) [ambient temp] | | |
| | Features | ATA Security; TCG Opal 2.0, DIPM; TRIM; DEVSLP | | |
| 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) ~ 0.14 in (3.65 mm) | | |
| | Width | 0.87 in (22 mm) | | |
| | NAND Type | MLC | | |

Technical Specifications – Storage

| | | |
|------------------------------|--|---------------------------------|
| Form-Factor (I/O) | M.2 2280 | |
| Interface | PCIe NVMe Gen3X4 | |
| Performance | Maximum Sequential Read | Maximum Sequential Write |
| | Up to 2288 MB/s | Up to 1600MB/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 1 TB, M.2 NVMe MLC Solid State Drive

| | | |
|------------------------------|--|---------------------------------|
| Drive Weight | 0.02 lb (10 g) | |
| Capacity | 1024 GB | |
| Height | 0.14 in (3.65 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 2,400 MB/s | Up to 1,500 MB/s |
| Logical Blocks | 2,000,409,264 | |
| Operating Temperature | 32° to 158°F (0° to 70°C) [ambient temp] | |
| Features | ATA Security, 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 (2.23 mm) | |
| Width | 0.87 in (22 mm) | |
| Generation | SM951 NVMe | |
| NAND Type | MLC | |
| Form-Factor (I/O) | M.2 2280 | |
| Interface | PCIe NVMe Gen3X4 | |
| Performance | Maximum Sequential Read | Maximum Sequential Write |
| | Up to 2,600 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 | |

HP Z Turbo Drive 512 GB, M.2 NVMe TLC Opal 2 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) |

Technical Specifications – Storage

| | | |
|------------------------------|--|---------------------------------|
| Generation | TLC | |
| NAND Type | M.2 2280 | |
| Form-Factor (I/O) | PCIe NVMe Gen3X4 | |
| Interface | 0.02 lb (10 g) | |
| 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; L1.2 | |

*For hard drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 16 GB (for Windows® 7) of system and up to 30 GB (for Windows® 8) disk is reserved for system recovery software.

Technical Specifications – Security

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 |

Technical Specifications – Networking

NETWORKING/COMMUNICATION

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

Ethernet Features

10 Mbit/s operation (10BASE-T; IEEE 802.3i; IEEE 802.3 clauses 13-14)
 100 10 Mbit/s operation (10BASE-T; IEEE 802.3i; IEEE 802.3 clauses 13-14)
 100 Mbit/s operation (100BASE-TX; IEEE 802.3u; IEEE 802.3 clauses 21-30)
 1000 Mbit/s operation (1000BASE-T; IEEE 802.3ab; IEEE 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)

Manageability

Intel® vPro
 iSCSI Boot
 RSS is kernel based support (e.g. in Win Server 2013)
 Ultra Low Power at cable disconnect (<1mW) enables platform support for connected standby.
 Wake-on-LAN from standby and hibernation (Magic Packet and Microsoft Wake-Up Frame); Wake-on-LAN from off (Magic Packet only)
 PXE 2.1 Remote Boot
 Statistics Gathering (SNMP MIB II, Ethernet-like MIB, Ethernet MIB (802.3x, clause 30))
 Comprehensive diagnostic and configuration software suite
 Virtual Cable Doctor for Ethernet cable status

Interface

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

NIC Device Driver Name

Intel® Ethernet Network Connection I219-LM

Technical Specifications – Networking

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

Ethernet Features

10 Mbit/s operation (10BASE-T; IEEE 802.3i; IEEE 802.3 clauses 13-14)
100 Mbit/s operation (10BASE-T; IEEE 802.3i; IEEE 802.3 clauses 13-14)
100 Mbit/s operation (100BASE-TX; IEEE 802.3u; IEEE 802.3 clauses 21-30)
1000 Mbit/s operation (1000BASE-T; IEEE 802.3ab; IEEE 802.3 Clauses 40)
Auto-Negotiation (Automatic Speed Selection)
Full Duplex Operation at all Speeds, Half Duplex operation at 10 and 100 Mbit/s
IEEE 802.1p QoS (Quality of Service) Support
IEEE 802.1q VLAN support
IEEE 802.3x Flow Control (IEEE 802.3 clauses 31-32; configurable)
IEEE 802.3az EEE(Energy Efficient Ethernet)
Jumbo Frame 9K
Auto MDI/MDIX Crossover cable detection

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

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

Manageability
Wake-on-LAN from standby and hibernation (Magic Packet and Microsoft Wake-Up Frame); Wake-on-LAN from off (Magic Packet only)
PXE 2.1 Remote Boot
Statistics Gathering (SNMP MIB II, Ethernet-like MIB, Ethernet MIB (802.3x, clause 30))
Comprehensive diagnostic and configuration software suite
Virtual Cable Doctor for Ethernet cable status

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

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

Technical Specifications – Networking

**HP lt4132 Qualcomm®
Snapdragon™ X5 LTE Mobile
Broadband Module***

| | |
|--|---|
| Technology/Operating Bands | LTE: 2100 (Band 1), 1900 (Band 2), 1800 (Band 3), 1700/2100 (Band 4), 850 (Band 5), 2600 (Band 7), 900 (Band 8), 700 (Band 12 lower), 700 (Band 13 upper), 700 (Band 17 lower), 800 (Band 20), 700 (Band 28). HSPA+: 2100 (Band 1), 1900 (Band 2), 1700/2100 (Band 4), 850 (Band 5), 900 (Band 8) MHz EV-DO: 850 (BC0), 1900 (BC1) MHz (Only work with Verizon network) E-GPRS: 1900 (Band 2), 1800 (Band 3), 850 (Band 5), 900 (Band 8) MHz |
| Wireless Protocol Standards | 3GPP Release 10 LTE Specification CAT.4, 20MHz BW WCDMA R99, 3GPP Release 5, 6, 7 and 8 UMTS Specification 1xEVDO Release 0, A and B. E-GPRS: Class B, Multi-slot class 12, coding schemes CS1 - CS4 and MSC1 - MSC9 |
| GPS | Standalone, A-GPS (MS-A, MS-B and XTRA) |
| GPS Bands | 1575.42 MHz (± 1.023 MHz), GLONASS 1596-1607MHz |
| Maximum Data Rates | LTE: 150 Mbps (Download), 50 Mbps (Upload) DC-HSPA+: 42 Mbps (Download), 5.76 Mbps (Upload) HSPA+: 21Mbps (Download), 5.76 Mbps (Upload) CDMA 1xRTT: 153.6 kbps (Download), 153.6 kbps (Upload) EVDO Rel.A: 3.1 Mbps (Download), 1.8 Mbps (Upload) EVDO Rel.B: 14.7 Mbps (Download), 5.4Mbps (Upload) EDGE: 236.8 kbps (Download), 236.8 kbps (Upload) GPRS: 85.6 kbps(Download), 85.6 kbps (Upload) |
| Maximum Output Power | LTE: 23 dBm HSPA+: 23.5 dBm 1xRTT/EVDO: 24dBm E-GPRS 1900/1800: 26 dBm E-GPRS 900/850: 27 dBm GPRS 1900/1800: 29.5 dBm GPRS 900/850: 32.5 dBm |
| Maximum Power Consumption | LTE: 1,200 mA (peak); 900 mA (average) HSPA+: 1,100 mA (peak); 800 mA (average) 1xRTT/EVDO: 1,000 mA (peak); 700 mA (average) |
| Form Factor | M.2, 3042-S3 Key B |
| Weight | 6.2 g |
| Dimensions (Length x Width x Thickness) | 1.65 x 1.18 x 0.09 in (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.

Technical Specifications – Networking

| | |
|--|--|
| HP hs3210 HSPA+ Intel® Mobile Broadband Module* | <p>Technology/Operating Bands LTE: 2100 (Band 1), 1900 (Band 2), 1800 (Band 3), 850 (Band 5), 2600 (Band 7), 900 (Band 8), 800 MHz (Band 20, DD800) 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</p> <p>Wireless Protocol Standards WCDMA R99, 3GPP Release 5, 6 and 7 UMTS Specification E-GPRS: Class B, Multi-slot class 33, coding schemes CS1 - CS4 and MSC1 - MSC9</p> <p>GPS Standalone, A-GPS</p> <p>GPS Bands 1575.42 MHz (± 1.023 MHz)</p> <p>Maximum Data Rates HSPA+: 21.6 Mbps (Download), 5.76 Mbps (Upload) E-GPRS: 296 kbps (Download), 236.8 kbps (Upload) GPRS: 107 kbps (Download), 85.6 kbps (Upload)</p> <p>Maximum Output Power HSPA+: 24 dBm E-GPRS 1800/1900: 26 dBm E-GPRS 850/900: 27 dBm GPRS 1800/1900: 30 dBm GPRS 850/900: 33 dBm</p> <p>Maximum Power Consumption HSPA+: 1,100 mA (peak); 800 mA (average) E-GPRS: 2,800 mA (peak); 700 mA (average)</p> <p>Form Factor M.2, 3042-S3 Key B</p> <p>Weight 6 g</p> <p>Dimensions (Length x Width x Thickness) 1.65 x 1.18 x 0.09 in (42 x 30 x 2.3 mm)</p> <p><small>*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.</small></p> |
|--|--|

| | |
|--|---|
| HP lt4120 Qualcomm® Snapdragon™ X5 LTE Mobile Broadband Module* | <p>Technology/Operating Bands LTE: 2100 (Band 1), 1900 (Band 2), 1800 (Band 3), 1700/2100 (Band 4), 850 (Band 5), 2600 (Band 7), 900 (Band 8), 700 (Band 12 lower), 700 (Band 13 upper), 700 (Band 17 lower), 800 (Band 20), 700 (Band 28). HSPA+: 2100 (Band 1), 1900 (Band 2), 1700/2100 (Band 4), 850 (Band 5), 900 (Band 8) MHz EV-DO: 850 (BC0), 1900 (BC1) MHz (Only work with Verizon network) E-GPRS: 1900 (Band 2), 1800 (Band 3), 850 (Band 5), 900 (Band 8) MHz</p> <p>Wireless Protocol Standards 3GPP Release 10 LTE Specification CAT.4, 20MHz BW WCDMA R99, 3GPP Release 5, 6, 7 and 8 UMTS Specification 1xEVDO Release 0, A and B. E-GPRS: Class B, Multi-slot class 12, coding schemes CS1 - CS4 and MSC1 - MSC9</p> <p>GPS Standalone, A-GPS (MS-A, MS-B and XTRA)</p> <p>GPS Bands 1575.42 MHz (± 1.023 MHz), GLONASS 1596-1607MHz</p> <p>Maximum Data Rates LTE: 150 Mbps (Download), 50 Mbps (Upload) DC-HSPA+: 42 Mbps (Download), 5.76 Mbps (Upload)</p> |
|--|---|

Technical Specifications – Networking

| | |
|--|---|
| | HSPA+: 21Mbps (Download), 5.76 Mbps (Upload) CDMA 1xRTT: 153.6 kbps (Download), 153.6 kbps (Upload) EVDO Rel.A: 3.1 Mbps (Download), 1.8 Mbps (Upload) EVDO Rel.B: 14.7 Mbps (Download), 5.4Mbps (Upload) EDGE: 236.8 kbps (Download), 236.8 kbps (Upload) GPRS: 85.6 kbps(Download), 85.6 kbps (Upload) |
| Maximum Output Power | LTE: 23 dBm HSPA+: 23.5 dBm 1xRTT/EVDO: 24dBm E-GPRS 1900/1800: 26 dBm E-GPRS 900/850: 27 dBm GPRS 1900/1800: 29.5 dBm GPRS 900/850: 32.5 dBm |
| Maximum Power Consumption | LTE: 1,200 mA (peak); 900 mA (average) HSPA+: 1,100 mA (peak); 800 mA (average) 1xRTT/EVDO: 1,000 mA (peak); 700 mA (average) |
| Form Factor | M.2, 3042-S3 Key B |
| Weight | 6.2 g |
| Dimensions (Length x Width x Thickness) | 1.65 x 1.18 x 0.09 in (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.

Technical Specifications – Networking

| | | |
|---|---|--|
| <p>Intel® Dual Band Wireless-AC 8265 802.11 AC/a/b/g/n (2x2) WiFi + Bluetooth® 4.2 Combo Adaptor* (vPro)</p> | <p>Wireless LAN Standards</p> | <p>IEEE 802.11a IEEE 802.11b IEEE 802.11g IEEE 802.11n IEEE 802.11n</p> |
| | <p>Interoperability</p> | <p>Wi-Fi certified</p> |
| | <p>Frequency Band</p> | <p>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</p> <p>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)</p> |
| | <p>Data Rates</p> | <ul style="list-style-type: none"> • 802.11a: 6, 9, 12, 18, 24, 36, 48, 54 Mbps • 802.11b: 1, 2, 5.5, 11 Mbps • 802.11g: 6, 9, 12, 18, 24, 36, 48, 54 Mbps • 802.11n: MCS 0 ~ MCS 15, (20MHz, and 40MHz) • 802.11ac : MCS0 ~ MCS9, (1SS, and 2SS) (20MHz, 40MHz, and 80MHz) |
| | <p>Modulation</p> | <p>Direct Sequence Spread Spectrum CCK, BPSK, QPSK, 16-QAM, 64-QAM, 256-QAM</p> |
| | <p>Security¹</p> | <ul style="list-style-type: none"> • 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 |
| | <p>Network Architecture Models</p> | <p>Ad-hoc (Peer to Peer) Infrastructure (Access Point Required)</p> |
| | <p>Roaming</p> | <p>IEEE 802.11 compliant roaming between band Access Points</p> |
| | <p>Output Power²</p> | <ul style="list-style-type: none"> • 802.11b : +16dBm minimum • 802.11g : +14dBm minimum • 802.11a : +14dBm minimum • 802.11n HT20(2.4GHz) : +13dBm minimum • 802.11n HT40(2.4GHz) : +13dBm minimum • 802.11n HT20(5GHz) : +12dBm minimum • 802.11n HT40(5GHz) : +12dBm minimum |
| | <p>Power Consumption</p> | <p>Transmit: 2.0 Watts (max) Receive: 1.6 Watts (max)</p> |

Technical Specifications – Networking

| | |
|---|---|
| | Idle mode (PSP): 180 mW (WLAN Associated) Idle mode: 50 mW (WLAN unassociated) Connect Standby: 10mW (WLAN + BT) Radio disabled: 5 mW |
| Power Management | ACPI and PCI Express compliant power management 802.11 compliant power saving mode |
| Receiver Sensitivity³ | 802.11b, 1Mbps : -94dBm maximum 802.11b, 11Mbps : -86dBm maximum 802.11g, 6Mbps : -88dBm maximum 802.11g, 54Mbps : -74dBm maximum 802.11a, 6Mbps : -88dBm maximum 802.11a, 54Mbps : -74dBm maximum 802.11n, MCS07 : -69dBm maximum 802.11n, MCS15 : -66dBm maximum 802.11ac, 1SS, MCS-0 : -86dBm maximum 802.11ac, 1SS, MCS-9 : -61dBm maximum 802.11ac, 2SS, MCS-0 : -83dBm maximum 802.11ac, 2SS, MCS-9 : -58dBm maximum |
| Antenna Type | High efficiency antenna with spatial diversity, mounted in the display enclosure Two embedded dual band 2.4/5 GHz antennas are provided to the card to support WLAN MIMO and Bluetooth communications |
| Form Factor | PCI-Express M.2 MiniCard |
| Dimensions | Type 2230 : 2.3 x 22.0 x 30.0 mm Or Type 1630 : 2.3 x 16.0 x 30.0 mm |
| Weight | Type 2230 : 2.8g Or Type 1630 : 2g |
| Operating Voltage | 3.3v +/- 9% |
| Temperature | Operating 14° to 158° F (-10° to 70° C) Non-operating -40° to 176° F (-40° to 80° C) |
| Humidity | Operating 10% to 90% (non-condensing) Non-operating 5% to 95% (non-condensing) |
| Altitude | Operating Non-operating 0 to 10,000 ft (3,048 m) 0 to 50,000 ft (15,240 m) |
| LED Activity | LED Amber – Radio OFF; LED White – Radio ON |

Technical Specifications – Networking

| HP Integrated Module with Bluetooth® 4.2 Wireless Technology | Bluetooth® Specification | 4.2 Compliant | | | | | | | | | | | | |
|---|--|---|------------|-----------|------------|------|---------|---------|----------------|---------|---------|-------|---------|---------|
| | Frequency Band | 2402 to 2480 MHz | | | | | | | | | | | | |
| | Number of Available Channels | Legacy: 0~79 (1 MHz/CH) BLE: 0~39 (2 MHz/CH) | | | | | | | | | | | | |
| | Data Rates and Throughput | Legacy: 3 Mbps data rate; throughput up to 2.17 Mbps BLE: 1 Mbps data rate; throughput up to 0.2 Mbps Legacy: Synchronous Connection Oriented links up to 3, 64 kbps, voice channels Legacy: Asynchronous Connection Less links 2178.1 kbps/177.1 kbps asymmetric (3-DH5) or 864 kbps symmetric (3-EV5) | | | | | | | | | | | | |
| | Transmit Power | The Bluetooth component shall operate as a Class II Bluetooth device with a maximum transmit power of +4 dBm for BR and EDR | | | | | | | | | | | | |
| | Receiver Sensitivity | <table border="1"> <thead> <tr> <th>Modulation</th> <th>0.01% BER</th> <th>0.001% BER</th> </tr> </thead> <tbody> <tr> <td>GFSK</td> <td>-80 dBm</td> <td>-70 dBm</td> </tr> <tr> <td>$\pi/4$-DQPSK</td> <td>-80 dBm</td> <td>-70 dBm</td> </tr> <tr> <td>8DPSK</td> <td>-80 dBm</td> <td>-70 dBm</td> </tr> </tbody> </table> | Modulation | 0.01% BER | 0.001% BER | GFSK | -80 dBm | -70 dBm | $\pi/4$ -DQPSK | -80 dBm | -70 dBm | 8DPSK | -80 dBm | -70 dBm |
| Modulation | 0.01% BER | 0.001% BER | | | | | | | | | | | | |
| GFSK | -80 dBm | -70 dBm | | | | | | | | | | | | |
| $\pi/4$ -DQPSK | -80 dBm | -70 dBm | | | | | | | | | | | | |
| 8DPSK | -80 dBm | -70 dBm | | | | | | | | | | | | |
| | Power Consumption | Peak (Tx) 330 mW Peak (Rx) 230 mW Selective Suspend 17 mW | | | | | | | | | | | | |
| | Antenna | Internally integrated within module | | | | | | | | | | | | |
| | Range | Legacy Up to 33 ft (10 m) BLE Up to 99 ft (30 m) | | | | | | | | | | | | |
| | Electrical Interface | USB 2.0 compliant | | | | | | | | | | | | |
| | Bluetooth® Software Supported | Microsoft Windows Bluetooth Software | | | | | | | | | | | | |
| | Link Topology | Point to Point, Multipoint Pico Nets up to 7 slaves | | | | | | | | | | | | |
| | Security | Full support of Bluetooth Security Provisions | | | | | | | | | | | | |
| | Power Management | Microsoft Windows ACPI, and USB Bus Support | | | | | | | | | | | | |
| | Certifications | Self-configurable to optimize power conservation in all operating modes, including Standby, Hold, Park, and Sniff | | | | | | | | | | | | |
| | Security | All necessary regulatory approvals for supported countries, including: FCC (47 CFR) Part 15C, Section 15.247 & 15.249 | | | | | | | | | | | | |
| | Power management certifications | ETS 300 328, ETS 300 826 Low Voltage Directive IEC950 UL, CSA, and CE Mark | | | | | | | | | | | | |
| | Certifications | Serial Port Profile (SPP)1 | | | | | | | | | | | | |
| | Bluetooth® Profiles Supported | Service Discovery Application Profile (SDAP) Dial-Up Networking (DUN)1,2 Generic Object Exchange Profile (GOEP)1,2 Object Push Profile (OPP)1,2 Hard Copy Cable Replacement (HCRP)1,2 Personal Area Networking Profile (PAN)1,2 Human Interface Device Profile (HID)1,2 Hands Free Profile (HFP) Advanced Audio Distribution Profile (A2DP) Audio Video Remote Control Profile (AVRCP) | | | | | | | | | | | | |

Technical Specifications – Networking

Bluetooth® V4.2 support feature

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

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

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

Technical Specifications – Networking

**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
Frequency Band**

Wi-Fi certified
802.11b/g/n

2.402 - 2.482 GHz

Note: The FCC has declared as of January 1, 2015 products that utilize passive scanning on channel 12/13 and are capable of transmitting must fully comply with requirements of 15.247 or otherwise disable those channels

802.11a

- 4.9 - 4.95 GHz (Japan)
- 5.15 - 5.25 GHz
- 5.25 - 5.35 GHz
- 5.47 - 5.725 GHz
- 5.825 - 5.850 GHz

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

Antenna Structure

2 transmit; 2 receive (2x2)

Data Rates

802.11a: 6, 9, 12, 18, 24, 36, 48, 54 Mbps
802.11b: 1, 2, 5.5, 11 Mbps
802.11g: 6, 9, 12, 18, 24, 36, 48, 54 Mbps
802.11n: card will support rates for NSS=1 and NSS=2 for RX and TX for 20 and 40 MHz channels. Short and long guard interval shall be supported.
802.11ac : MCS0 ~ MCS9, (1SS, and 2SS) (20MHz, 40MHz, and 80MHz)

Modulation

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

Security¹

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

**Network Architecture
Models**

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

Roaming

IEEE 802.11 compliant roaming between access points

Output Power²

- 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 Sensitivity³ | 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).

HP Integrated Module with Bluetooth® 4.2 Wireless Technology

| | |
|-------------------------------------|--|
| Bluetooth Specification | 4.0+EDR Compliant |
| Frequency Band | 2402 to 2480 MHz |
| Number of Available Channels | 79 (1 MHz) available channels |
| Data Rates and Throughput | 3 Mbps data rate; throughput up to 2.17 Mbps |

Technical Specifications – Networking

| | |
|--------------------------------------|--|
| | Synchronous Connection Oriented links up to 3, 64 kbps, voice channels |
| | Asynchronous Connection Less links 2178.1 kbps/177.1 kbps asymmetric or 1306.9 kbps symmetric |
| Transmit Power | The Bluetooth component shall operate as a Class II Bluetooth device with a maximum transmit power of +4 dBm for BR and EDR |
| Receiver Sensitivity | Better than -20 dBm at 0.1 % raw bit error rate |
| Power Consumption | Peak (Tx) 330 mW Peak (Rx) 230 mW Selective Suspend 17 mW |
| Antenna | Internally integrated within module |
| Range | Up to 33 ft. (10 m) |
| Electrical Interface | USB 2.0 compliant Microsoft Windows Plug and Play compliant |
| Bluetooth® Software Supported | Broadcom Bluetooth for Windows Microsoft Windows Bluetooth Software |
| Link Topology | Point to Point, Multipoint Pico Nets up to 7 slaves |
| Security | Full support of Bluetooth Security Provisions |
| Power Management | Microsoft Windows ACPI, and USB Bus Support Self-configurable to optimize power conservation in all operating modes, including Standby, Hold, Park, and Sniff |
| Certifications | All necessary regulatory approvals for supported countries, including: FCC (47 CFR) Part 15C, Section 15.247 & 15.249 ETS 300 328, ETS 300 826 Low Voltage Directive IEC950 UL, CSA, and CE Mark |
| Bluetooth® Profiles Supported | Serial Port Profile (SPP) ¹ Service Discovery Application Profile (SDAP) Dial-Up Networking (DUN) ^{1,2} Generic Object Exchange Profile (GOEP) ^{1,2} Object Push Profile (OPP) ^{1,2} File Transfer Profile (FTP) Synchronization Profile (SYNC) Hard Copy Cable Replacement (HCRP) ^{1,2} Personal Area Networking Profile (PAN) ^{1,2} Human Interface Device Profile (HID) ^{1,2} FAX Profile (FAX) Basic Imaging Profile (BIP) ² Headset Profile (HSP) Hands Free Profile (HFP) Advanced Audio Distribution Profile (A2DP) |

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

2. Indicates the profile is part of Windows Vista

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

Technical Specifications – Networking

| | | |
|--|---|--|
| <p>Intel® Dual Band Wireless-AC 3168 802.11 ac (1x1) WiFi and Bluetooth® 4.2 Combo Adapter (non-vPro)</p> | <p>Wireless LAN Standards</p> | <p>IEEE 802.11a IEEE 802.11b IEEE 802.11g IEEE 802.11n IEEE 802.11ac</p> |
| | <p>Interoperability</p> | <p>Wi-Fi certified</p> |
| | <p>Frequency Band</p> | <p>802.11b/g/n</p> <ul style="list-style-type: none"> • 2.402 – 2.482 GHz |
| | | <p>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.</p> |
| | | <p>802.11a/n</p> <ul style="list-style-type: none"> • 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 |
| | <p>Data Rates</p> | <p>Note: Indonesia only supports 5.725 - 5.825 GHz (CH149 - CH161)</p> <ul style="list-style-type: none"> • 802.11b: 1, 2, 5.5, 11 Mbps • 802.11g: 6, 9, 12, 18, 24, 36, 48, 54 Mbps • 802.11a: 6, 9, 12, 18, 24, 36, 48, 54 Mbps • 802.11n: MCS 0 ~ MCS 15, (20MHz, and 40MHz) • 802.11ac : MCS0 ~ MCS7, (1SS) (20MHz, 40MHz, and 80MHz) |
| | <p>Modulation</p> | <p>Direct Sequence Spread Spectrum BPSK, QPSK, CCK, 16-QAM, 64-QAM, 256-QAM</p> |
| | <p>Security¹</p> | <ul style="list-style-type: none"> • 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 |
| | <p>Network Architecture Models</p> | <p>Ad-hoc (Peer to Peer) Infrastructure (Access Point Required)</p> |
| | <p>Roaming</p> | <p>IEEE 802.11 compliant roaming between access points</p> |
| | <p>Output Power²</p> | <ul style="list-style-type: none"> • 802.11b : +16dBm minimum • 802.11g : +14dBm minimum • 802.11a : +14dBm minimum • 802.11n HT20(2.4GHz) : +13dBm minimum • 802.11n HT40(2.4GHz) : +13dBm minimum • 802.11n HT20(5GHz) : +12dBm minimum • 802.11n HT40(5GHz) : +12dBm minimum • 802.11ac 80MHz(5GHz) : +11dBm minimum |
| | <p>Power Consumption</p> | <p>Transmit: 2.0 W (max)</p> |

Technical Specifications – Networking

| | |
|---|---|
| | Receive: 1.6 W (max) |
| | Idle mode (PSP): 180 mW (WLAN Associated) |
| | Idle mode: 60 mW (WLAN unassociated) |
| | Radio disabled: 30 mW |
| Power Management | ACPI and PCI Express compliant power management 802.11 compliant power saving mode |
| Receiver Sensitivity³ | 802.11b, 1Mbps : -94dBm maximum 802.11b, 11Mbps : -86dBm maximum 802.11g, 6Mbps : -88dBm maximum 802.11g, 54Mbps : -74dBm maximum 802.11a, 6Mbps : -86dBm maximum 802.11a, 54Mbps : -72dBm maximum 802.11n, MCS07 : -69dBm maximum 802.11n, MCS15 : -66dBm maximum 802.11ac, 1SS, MCS-0 : -86dBm maximum 802.11ac, 1SS, MCS-9 : -61dBm maximum 802.11ac, 2SS, MCS-0 : -83dBm maximum 802.11ac, 2SS, MCS-9 : -58dBm maximum |
| Antenna type | High efficiency antenna with spatial diversity, mounted in the display enclosure Two embedded dual band 2.4/5 GHz antennas are provided to the card to support WLAN MIMO communications and Bluetooth communications |
| Form Factor | PCI-Express M.2 MiniCard |
| Dimensions | Type 2230 : 2.3 x 22.0 x 30.0 mm Or Type 1630 : 2.3 x 16.0 x 30.0 mm |
| Weight | Type 2230 : 2.8g Or Type 1630 : 2g |
| Operating Voltage | 3.3v +/- 9% |
| Temperature | Operating 14° to 158° F (-10° to 70° C) Non-operating 40° to 176° F (-40° to 80° C) |
| Humidity | Operating 10% to 90% (non-condensing) Non-operating 5% to 95% (non-condensing) |
| Altitude | Operating 0 to 10,000 ft (3,048 m) Non-operating 0 to 50,000 ft (15,240 m) |
| Near Field Communications (NFC) | |
| Controller | HP Module with NXP NFC Controller NPC100 |
| Supports | <ul style="list-style-type: none"> • Windows 8, Proximity Events • Windows 7, PC/SC • NFC Forum Compliant • Near Field Communications Controller |
| Dimensions (L x W x H) | Module 25 mm by 10 mm by 2.0 mm |
| Chipset | NPC100 |
| System interface | I2C |
| NFC RF standards | standards ISO/IEC 14443 A ISO/IEC 14443 B ISO/IEC 15693 ISO/IEC 18092 ECMA-340 NFCIP-1 Target and Initiator ECMA-320 NFCIP-2 |

Technical Specifications – Networking

| | |
|---------------------------------|--|
| NFC Forum Support Tag | Type 1, Type 2, Type3 and Type 4, NFCIP-1 and NFCIP-2 |
| Reader | (PCD-VCD) Mode(1) ISO/IEC 14443 A ISO/IEC 14443 B ISO/IEC 15693 MIFARE 1K MIFARE 4K MIFARE DESFire FeliCa Jewel and Topaz cards |
| Card Emulation | (PICC-VICC) |
| Mode¹ | ISO/IEC 14443 A ISO/IEC 14443 B and B' MIFARE FeliCa |
| Frequency | 13.56 MHz |
| NFC Modes Supported | Reader/Writer, Peer-to-Peer |
| Raw RF Data Rates | 106, 212, 424, 848 kbps |
| Operating temperature | 0°C to 70°C |
| Storage temperature | -20°C to 125°C |
| Humidity | 10-90% operating 5-95% non-operating |
| Supply Operating voltage | 2.97 to 5.5 Volts |
| I/O Voltage | 1.8V or 3.3V |
| Power Consumption | Booster enable, VBAT= 3.3V, VCC_BOOST = 5V) Typical ² Polling 7.3 mA Detected Test Tag Type 1 Total 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 Mode Power Consumption, |
| Antenna connector | 0.5mm pitch, 7 connector FPC. Antenna matching is external to module. |
| Notes | <ol style="list-style-type: none">1. With application or UICC support2. Actual Power Consumption is dependent on NFC antenna and matching circuit and on the particular polling sequence and period configured. |

Technical Specifications – Audio

AUDIO/MULTIMEDIA – BANG & OLUFSEN

| | | |
|-----------------------------------|----------------------------------|---|
| Hardware | Implementation | Conexant CX7700 |
| | Function Key | Volume up, volume down, and mute |
| | Volume Controls | |
| | Full Duplex | Yes |
| | Microphone In | Stereo |
| | Headphone/Line Out | Stereo |
| | Integrated Microphone | Yes, dual digital microphone array when equipped with optional webcam |
| Audio Output Quality | Frequency Response | 20 Hz - 20 kHz |
| | Signal to Noise Ratio | 106dB (DAC), 102dB (ADC) |
| | Total Harmonic Distortion | 91dB THD+n on LineOut/HP (0.003%) |
| | Noise Floor | -110 dB |
| | Play Sampling Rate(s) | Up to 192kHz |
| | Record Sampling Rate(s) | Up to 96kHz |
| | DAC | 16, 20 or 24-bit |
| | ADC | 16,20 or 24-bit |
| Integrated Stereo Speakers | Power Rating | 2 Watts |
| | Impedance | 4 Ohms |

Technical Specifications – Power

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 | 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 | 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) | | |

Technical Specifications – Power

| | | |
|---|---|-------------------------------|
| 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 | <p>*CE Mark - full compliance with LVD and EMC directives</p> <p>* 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.</p> <p>* MTBF - over 200,000 hours at 25°C ambient condition.</p> | |

| | | | |
|--------------------------------------|---|--|--|
| 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 | <p>*CE Mark - full compliance with LVD and EMC directives</p> <p>* 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.</p> <p>* MTBF - over 200,000 hours at 25°C ambient condition.</p> | | |

| | | | |
|--|-------------------------------|---|-----------------------------|
| HP Long Life 3-cell Polymer Battery (51Whr) | Dimensions (H x W x L) | 6.8mm x 102.8mm x 198mm | |
| | Weight | 235 g | |
| | Cells/Type | 3cell Lithium-Ion Polymer cell / 506480 | |
| | Energy | Voltage | 11.55V |
| | | Amp-hour capacity | 4420mAh |
| | | Watt-hour capacity | 51wh |
| | Temperature | Operating (Charging) | 32° to 113° F (0° to 45° C) |
| Operating (Discharging) | | 14° to 140° F(-10° to 60° C) | |

Technical Specifications – Power

| | |
|--|------------------------------|
| Fuel Gauge LED | No |
| Warranty | 1000 cycles > 65% (at 23 °C) |
| 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.

System Configuration

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

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

| | 115VAC, 60Hz | 230VAC, 50Hz | 100VAC, 50Hz |
|-------------------------------|--------------|--------------|--------------|
| Normal Operation (Short idle) | 5.86 W | 5.86 W | 5.99 W |
| Normal Operation (Long idle) | 3.14 W | 3.73 W | 3.40 W |
| Sleep | 0.71 W | 0.79 W | 0.72 W |
| Off | 0.40 W | 0.48 W | 0.40 W |

Note:

Energy efficiency data listed is for an ENERGY STAR® compliant product if offered within the model family. HP computers marked with the ENERGY STAR® Logo are compliant with the applicable U.S. Environmental Protection Agency (EPA) ENERGY STAR® specifications for computers. If a model family does not offer ENERGY STAR® compliant configurations, then energy efficiency data listed is for a typically configured PC featuring a hard disk drive, a high efficiency power supply, and a Microsoft Windows® operating system.

Heat Dissipation*

| | 115VAC, 60Hz | 230VAC, 50Hz | 100VAC, 50Hz |
|-------------------------------|--------------|--------------|--------------|
| Normal Operation (Short idle) | 20 BTU/hr | 20 BTU/hr | 20 BTU/hr |
| Normal Operation (Long idle) | 11 BTU/hr | 13 BTU/hr | 12 BTU/hr |
| Sleep | 2 BTU/hr | 3 BTU/hr | 2 BTU/hr |
| Off | 1 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 | 22 |
| Fixed Disk – Random writes | 3.5 | 28 |

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:

Technical Specifications – Power

- 2 USB ports
- 1 Smart Card reader
- 1 SD Card reader
- 1 SIM module slot
- 2 SODIMM memory slots
- Optional expansion base docking station

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

Batteries

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

Batteries used in the product do not contain:

- Mercury greater than 1ppm by weight
- Cadmium greater than 20ppm by weight

Battery size: CR2032 (coin cell)

Battery type: Lithium

Additional Information

- This product is in compliance with the Restrictions of Hazardous Substances (RoHS) directive - 2011/65/EC.
- This HP product is designed to comply with the Waste Electrical and Electronic Equipment (WEEE) Directive – 2002/96/EC.
- This product is in compliance with California Proposition 65 (State of California; Safe Drinking Water and Toxic Enforcement Act of 1986).
- This product is in compliance with the IEEE 1680 (EPEAT) standard at the <Gold> level, see www.epeat.net
- Plastics parts weighing over 25 grams used in the product are marked per ISO11469 and ISO1043.
- This product contains 0% post-consumer recycled plastic (by wt.)
- This product is 95.2% recycle-able when properly disposed of at end of life.

Packaging Materials

| | | |
|------------------|---|-------|
| External: | PAPER/Corrugated | 348 g |
| Internal: | PLASTIC/Polyethylene Expanded - EPE | 38 g |
| | PLASTIC/Polyethylene low density - LDPE | 15 g |
| | PLASTIC/Polypropylene - PP | 5 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

Technical Specifications – Power

- 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)
- Polybrominated Biphenyl Oxides (PBBOs)
- Polychlorinated Biphenyl (PCB)
- Polychlorinated Terphenyls (PCT)
- Polyvinyl Chloride (PVC) – except for wires and cables, and certain retail packaging has been voluntarily removed from most applications.
- Radioactive Substances
- Tributyl Tin (TBT), Triphenyl Tin (TPT), Tributyl Tin Oxide (TBTO)

Packaging Usage

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

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

End-of-life Management and Recycling

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

The EU WEEE directive (2002/95/EC) requires manufacturers to provide treatment information for each product type for use by treatment facilities. This information (product disassembly instructions) is posted on the HP Inc. web site at: <http://www.hp.com/go/recyclers>. These instructions may be used by recyclers and other WEEE treatment facilities as well as HP OEM customers who integrate and re-sell HP equipment.

HP Inc. Corporate Environmental Information

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

Global Citizenship Report

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

Eco-label certifications

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

ISO 14001 certificates:

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

and

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

Technical Specifications – Power

Country of Origin

China

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

| Type | Description | Part # |
|-------------------------------|--|-------------|
| Memory | HP 4GB DDR4-2400 SODIMM (Core processors only) | Z4Y84AA |
| | HP 8GB DDR4-2400 SODIMM (Core processors only) | Z4Y86AA |
| Cases | HP Executive 15.6 Black Top Load | P6N18AA |
| | HP Business Case (up to 15.6") | H5M92AA |
| Docking | HP UltraSlim Docking Station | D9Y32AA |
| | HP 2013 UltraSlim Docking Station TAA (US only) | E5C22AV#ABA |
| | HP Executive Travel Hub | TOK29AA |
| | HP Travel Hub | TOK30AA |
| | HP 3005pr USB 3.0 Port Replicator w/ USB-C Adapter | Y4H06AA |
| | HP Display and Notebook Stand II | E8G00AA#xxx |
| | HP USB-Type C™ Elite Dock | X7W54AA |
| Input/Output - Mice | HP Comfort Grip Mouse | H2L63AA |
| | HP 3-Button Laser Mouse | H4B81AA#xxx |
| | HP Ultra Mobile Wireless Mouse | H6F25AA#xxx |
| | HP X4000 Bluetooth Mouse | H3T50AA#xxx |
| | HP Slim Bluetooth Mouse | F3J92AA#xxx |
| | HP Ultrathin Wireless Mouse | L9V78AA |
| | HP USB Travel Mouse | G1K28AA#xxx |
| | HP Slim Wireless Keyboard and Mouse | T6L04AA#xxx |
| | HP USB Essential Keyboard and Mouse | H6L29AA#xxx |
| | HP Slim USB Keyboard and Mouse | T6T83AA |
| HP Wireless (Link-5) Keyboard | T6U20AA#xxx | |
| Power Adapters | HP 65W Slim A/C Adapter w/USB | H6Y82AA |
| | HP 90W Slim A/C Adapter w/USB | H6Y83AA |
| | HP 90W Slim Auto Combo AC Adapter w/USB | H6Y84AA |
| | HP 65W Smart AC Adapter | H6Y89AA |
| | HP 90W Smart AC Adapter | H6Y90AA |
| Battery | HP TA03XL Rechargeable Battery | 1FN06AA |
| Adapters | HP USB-C™ to VGA Adapter | N9K76AA |
| | HP USB-C to USB 3.0 | N2Z63AA |
| | HP USB-C to USB Hub | Z6A00AA |
| | HP USB-C™ to DisplayPort™ Adapter | N9K78AA |
| | HP USB-C™ to DisplayPort™ Adapter | N9K78AA |
| | HP HDMI to DVI adapter | F5A28AA |

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

| | | |
|-----------------------------------|---|-------------|
| | DisplayPort™ to DVI Adapter | F7W96AA |
| | DisplayPort™ to VGA | F7W97AA |
| | DisplayPort™ to HDMI 1.4 Adapter | F3W43AA |
| Wireless | HP Lt4120 LTE/EVDO/HSPA+ Gobi™ 4G Mobile Broadband Module | TBD |
| Collaboration | HP UC Conferencing Keyboard | K8P74AA#xxx |
| | HP UC Speaker Phone | K7V16AA |
| | HP UC Wired Headset | K7V17AA |
| | HP UC Mono Wireless Headset | W3K08AA |
| | HP UC Duo Wireless Headset | W3K09AA |
| | 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 256GB M2 NVME PCIe SSD (2280) | V3K66AA |
| | HP 512GB M2 NVME PCIe SSD (2280) | V3K67AA |
| Security | HP Dual Head Cable Lock (Non-Master key) | T1A64AA |
| | HP Dual Head Cable Lock (Master Key) | T1A65AA |
| | HP 15.6" Notebook PC Privacy Filter (non-touch) | J7H71AA |
| | HP Docking Station Cable Lock | AU656AA#XXX |
| | HP Essential Combination Lock | TOY16AA |
| | HP Combination Lock | TOY15AA |
| | HP Keyed Cable Lock | TOY14AA |
| | HP 15'6 Privacy Filter (touch panel) | V8Z58AA#xxx |

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: |
|------------------------|-------------------------|----------------|---|
| March 1, 2017 | From v1 to v2 | Added | Intel 4120 and 4132 wireless networking cards, |
| | | Changed | Phrasing of 3 bullet in at a Glance, Environmental section |
| April 1, 2017 | From v2 to v3 | Changed | Displays HDAG-touch and FHD weight |
| April 21, 2017 | From v3 to v4 | Changed | In the Power section under Battery Life subsection changed the results of the Battery life tests from 10 hours to 12 hours 14 min, Changed the EPEAT disclaimer to satisfy the criteria for a renewable energy accessory. |
| April 24, 2017 | From v4 to v5 | Removed | Integrated Bluetooth compatibility with 4.0, 4.1 |

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