

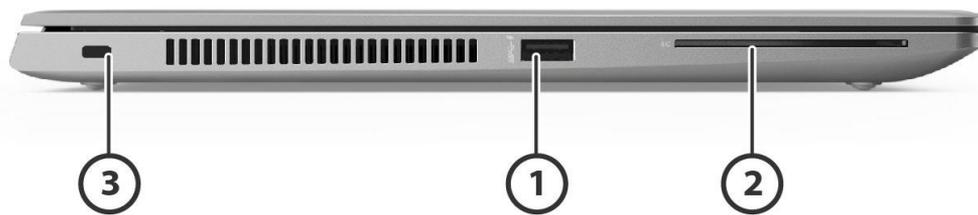
### Overview

### HP ZBook 14u G5 Mobile Workstation



**Front**

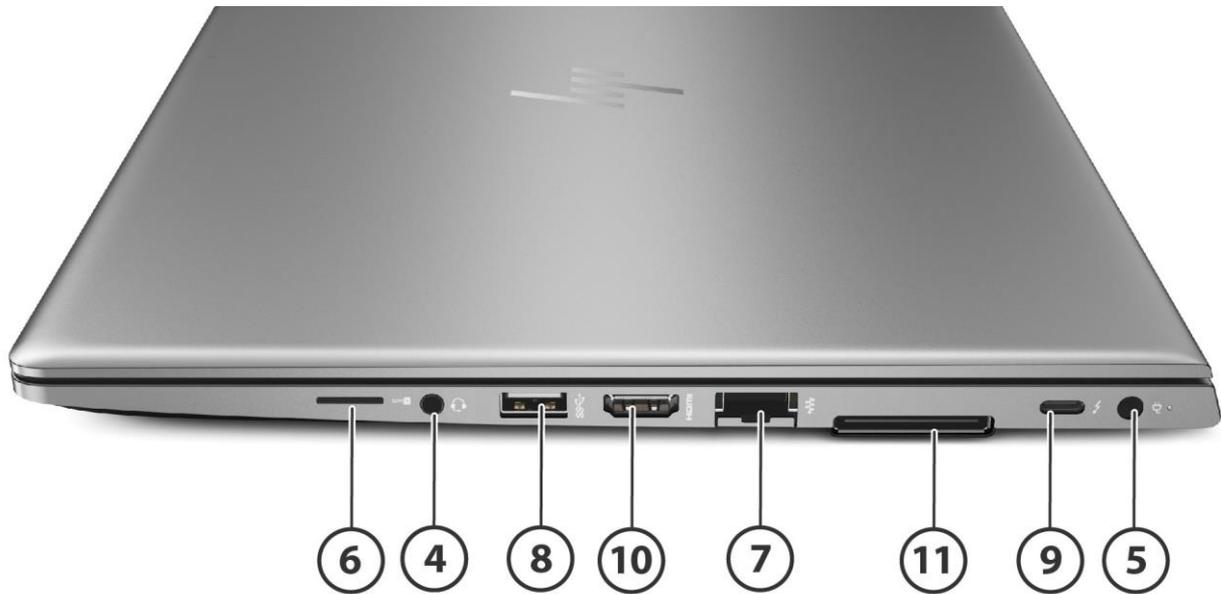
### Overview



#### Left

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

### Overview



#### Right

- 4. 1 headphone/microphone combo
- 5. 1 power connector
- 6. 1 UHS-II SD card reader
- 7. 1 Ethernet port (RJ-45)
- 8. 1 USB 3.0
- 9. Thunderbolt 3™
- 10. 1 HDMI port
- 11. Side Docking 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 "Turbo Silver" color. Backlight keyboard in full aluminum deck with magnesium bottom reinforcement, chemically strengthened glass touchpad, and updated system functions indicators. HP Spill Resistant Collaboration Keyboard with Durakeys, touchpad buttons with Duracoat finish..
- Designed to pass military standard MIL-STD-810G testing\*.
- Workstation-caliber AMD Radeon Pro™ discrete graphics: AMD Radeon Pro™ WX3100 (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 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, 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 or HP Thunderbolt Docking Station. 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 (50 WHr) HP Long Life Battery
- 2 discrete buttons with LED indicator for convenient one touch access: Wireless On/Off, Volume Mute
- Widescreen 14-inch diagonal anti-glare LED-backlit display:
- FHD (1920x1080) ultrawide viewing angle, FHD Touch (1920x1080) standard viewing angle, FHD Touch (1920x1080) standard viewing angle w/ SureView privacy technology, UHD (3840x2160) ultrawide viewing angle
- Supports wireless LAN and wireless WAN options for connectivity on the go.
- One dedicated drive slots. (1) M.2 slot
- 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](http://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. 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

<b>Preinstalled OS</b>	Windows 10 Pro 64*
	Windows 10 Home 64 High End*
	FreeDOS 2.0
<b>Supported OS</b>	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>

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#### PROCESSOR\*

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  
8th Generation Intel® Core™ i7 8650U (1.9 GHz, 8 MB cache, 4 cores) \* Up to 4.2 GHz with Intel® Turbo Boost Technology  
8th Generation Intel® Core™ i7 8550U (1.8 GHz, 8 MB cache, 4 cores) \* Up to 4.0 GHz with Intel® Turbo Boost Technology  
8th Generation Intel® Core™ i5 8350U (1.7 GHz, 6 MB cache, 4 cores) \* Up to 3.6 GHz with Intel® Turbo Boost Technology  
8th Generation Intel® Core™ i5 8250U (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.

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### Features

#### CHIPSET

Intel® Kaby Lake Chipset integrated with processor

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#### 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.

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#### GRAPHICS

Intel® UHD 620 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

\*\* 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).

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#### DISPLAY

##### Internal

14.0" diagonal LED backlit FHD UWVA eDP anti-glare (1920 x 1080)

14.0" diagonal LED backlit FHD UWVA eDP+PSR anti-glare (1920 x 1080)

14.0" diagonal Touch LED-backlit FHD UWVA eDP (1920 x 1080)

14.0" diagonal Touch LED-backlit FHD UWVA eDP+PSR, anti-glare + SureView Privacy filter (1920 x 1080)

14.0" diagonal LED backlit UHD UWVA eDP+PSR (3840 x 2160)

##### External

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

##### 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.

### Features

#### 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.

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## STORAGE AND DRIVES

### Primary Storage Bay

#### M.2 SATA SED SSD

512GB SATA-3 SS TLC SSD FIPS-140-2

#### HP Z Turbo Drive (NVMe PCIe SSD)

256GB PCIe Gen3x4 (NVMe) TLC Solid State Drive

512GB PCIe Gen3x4 (NVMe) TLC Solid State Drive

1TB PCIe Gen3x4 (NVMe) TLC Solid State Drive

256GB PCIe Gen3x4 (NVMe) TLC Solid State Drive Opal 2

512GB PCIe Gen3x4 (NVMe) TLC Solid State Drive Opal 2

256GB PCIe Gen3x4 (NVMe) MLC Solid State Drive

512GB PCIe Gen3x4 (NVMe) MLC Solid State Drive

1TB PCIe Gen3x4 (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.

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### Features

#### DRIVE CONTROLLERS

M.2 Storage Bay (SATA):	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 2400MT/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

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 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)

##### Wireless WAN - Mobile Broadband \*\*

### Features

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

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

HP hs3210 HSPA+ Mobile Broadband Module (optional)

#### **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.

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## 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**

720 HD webcam with IR (Near infrared 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

\* HD content required to view HD images.

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## 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 86-key compatible keyboard features a full-pitch key layout with desktop keyboard features, such as editing keys, both left and right control and alt keys, function keys, and 18.7 x 18.4 mm key pitch (center-to-center spacing). U.S. and International key layouts are available. Other features include hot keys for instant access to power conservation and brightness.

### Features

#### Pointing Devices

Point stick with two additional point stick buttons

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

#### Function Keys

Function keys provide control of the following features: standby mode, external display, volume down, volume up, 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 - Backlit Toggle

F10 - Numlk

F11 - Wireless

F12 - Calendar

>Share/Present

>Call Answer

>Call End

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## SOFTWARE AND SECURITY

### Preinstalled Software with Windows Operating System

#### BIOS

HP BIOSphere Gen3<sup>1</sup>

HP Sure Start Gen3<sup>2</sup>

HP DriveLock | HP Automatic DriveLock

BIOS Update via Network

Master Boot Record Security

Power On Authentication

Secure Erase<sup>3</sup>

Absolute Persistence Module<sup>4</sup>

Pre-boot Authentication

#### Multi Media

Cyberlink Power MediaPlayer CMIT

#### Communication / Connectivity

HP Mobile Connect Pro<sup>5</sup>

Native Miracast Support<sup>6</sup>

HP LAN-WLAN Protection

HP MAC Address Manager (select models only)

HP Wireless Wakeup (select models only)

HP SureConnect

#### HP Value Add Software

HP 3D DriveGuard 6

HP ePrint Driver + JetAdvantage<sup>7</sup>

### Features

HP Hotkey Support  
HP Recovery Manager  
HP Jumpstart  
HP Support Assistant<sup>12</sup>  
HP Noise Cancellation Software  
HP Performance Advisor  
HP Remote Graphics Software  
HP Velocity

#### Microsoft Products

Buy Office  
Bing Search  
Skype<sup>8</sup>

#### Manageability

HP Driver Packs<sup>9</sup>  
HP SoftPaq Download Manager (SDM)  
HP System Software Manager (SSM)<sup>9</sup>  
HP BIOS Config Utility (BCU)<sup>9</sup>  
HP Client Catalog<sup>9</sup>  
HP Manageability Integration Kit for Microsoft SCCM<sup>10</sup>  
HP Image Assistant  
LANDESK Management<sup>11</sup>

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

#### Client Security Software

- HP Client Security Suite Gen3<sup>13</sup>
- HP Security Manager (including Credential Manager and Password Manager)
- HP Fingerprint Sensor
- Power On Authentication
- Device Access Manager
- Microsoft Defender<sup>14</sup>
- HP WorkWise<sup>15</sup>

#### Standard

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

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

1. Requires Intel® 7th generation processors
2. Available on HP Elite and Z products equipped with Intel® 7th generation processors.
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>

### Features

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.

#### 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>

#### 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.

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## HP CENTRAL MANAGEMENT

### Features

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.

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### Features

#### POWER

**Power Supply**

HP 65W Slim Smart AC Adapter

**Primary Battery**

HP 3-cell Long Life Polymer Battery (50 WHr)

**Battery Life**

Battery life up to 10 hours \*

**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® Polaris™ Technology

Hibernation

Standby

ACPI compliance

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#### 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](http://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.

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#### WEIGHTS & DIMENSIONS

**Weight**

Starting at 3.27 lb (1.48 kg)

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

12.84 x 9.22 x 0.71 in

326 x 234.3 x 17.9 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).

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### Features

#### 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

##### 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 the same 1-year or 3-year limited warranty as the platform. Optional<sup>1</sup> 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

<b>Stand-Alone Power Requirements (AC Power)</b>	<b>Nominal Operating Voltage</b>	19.5 V dc @ 3.3 A	
	<b>Average Operating Power</b>		<b>Windows® 10 (64-bit)</b>
		AMD FirePro™ Graphics	
	<b>Max Operating Power</b>	< 65 W	
<b>Temperature</b>	<b>Operating</b>	32° to 95° F (0° to 35° C) (not writing optical) 41° to 95° F (5° to 35° C) (writing optical)	
	<b>Non-operating</b>	-4° to 140° F (-20° to 60° C)	
<b>Relative Humidity</b>	<b>Operating</b>	10% to 90%, non-condensing	
	<b>Non-operating</b>	5% to 95%, 101.6° F (38.7° C) maximum wet bulb temperature	
<b>Shock</b>	<b>Operating</b>	40 G, 2 ms, half-sine	
	<b>Non-operating</b>	200 G, 2 ms, half-sine	
<b>Random Vibration</b>	<b>Operating</b>	0.75 grms	
	<b>Non-operating</b>	1.50 grms	
<b>Altitude (unpressurized)</b>	<b>Operating</b>	-50 to 10,000 ft. (-15.24 to 3,048 m)	
	<b>Non-operating</b>	-50 to 15,000 ft. (-15.24 to 12,192 m)	
<b>Planned Industry Standard Certifications</b>	<b>UL</b>	Yes	
	<b>CSA</b>	Yes	
	<b>FCC Compliance</b>	Yes	
	<b>ENERGY STAR®</b>	Select models*	
	<b>EPEAT®</b>	Gold target**	
	<b>ICES</b>	Yes	
	<b>Australia / NZ A-Tick Compliance</b>	Yes	
	<b>CCC</b>	Yes	
	<b>Japan VCCI Compliance</b>	Yes	
	<b>KCC</b>	Yes	
	<b>BSMI</b>	Yes	
	<b>CE Marking Compliance</b>	Yes	
	<b>MIL STD***</b>	Planned	

\* Configurations of the HP ZBook 14u G5 that are ENERGY STAR® certified are identified as HP ZBook 14u 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

<b>14.0" diagonal LED backlight FHD UWVA IPS eDP Anti-glare (1920 x 1080)</b>	<b>Dimensions (W x H)</b>	315.41 x 196.17 max. (w/ PCB)
	<b>Active Area</b>	309.37 x 174.02 (mm)
	<b>Weight</b>	225g max
	<b>Surface Treatment</b>	Anti-glare
	<b>Contrast Ratio</b>	600:1 (typical)
	<b>Refresh Rate</b>	60 Hz
	<b>Brightness</b>	340 nits
	<b>Pixel Resolution</b>	<b>Format</b> 1920 x 1080 (FHD)
		<b>Configuration</b> RGB
	<b>Backlight</b>	LED
	<b>PPI</b>	157
	<b>Viewing Angle</b>	UWVA 85/85/85/85

<b>14.0" diagonal LED backlight FHD SVA eDP Anti-glare (1920 x 1080)</b>	<b>Outline Dimensions (W x H x D)</b>	320.9 x 205.6 x 3 (mm) max
	<b>Active Area</b>	309.40 x 173.95 (mm)
	<b>Weight</b>	270 g max
	<b>Diagonal Size</b>	14.0 (inch)
	<b>Surface Treatment</b>	Anti-Glare (AG)
	<b>Contrast Ratio</b>	300:1 (typical)
	<b>Refresh Rate</b>	60 Hz
	<b>Brightness</b>	300 nits
	<b>Pixel Resolution</b>	<b>Format</b> 1920 x 1080 (FHD)
		<b>Configuration</b> RGB
	<b>Interface</b>	eDP 1.2
	<b>PPI</b>	157
<b>Viewing Angle</b>	SVA 45/45/25/35	

<b>14.0" diagonal LED backlight FHD SVA eDP (1920 x 1080) Touch with Camera</b>	<b>Outline Dimensions (W x H x D)</b>	320.9 x 205.6 x 3 (mm) max
	<b>Active Area</b>	309.40 x 173.95 (mm)
	<b>Weight</b>	270 g max
	<b>Diagonal Size</b>	14.0 (inch)
	<b>Surface Treatment</b>	Anti-smudge/fingerprint coating
	<b>Contrast Ratio</b>	300:1 (typical)
	<b>Touch Enabled</b>	Yes
	<b>TSP Type</b>	Capacitive
	<b>Refresh Rate</b>	60 Hz
	<b>Brightness</b>	300 nits
	<b>Pixel Resolution</b>	<b>Format</b> 1920 x 1080 (FHD)

### Technical Specifications – Displays

<b>14.0" diagonal LED backlight HD SVA eDP (1366 x 768)</b>	<b>Interface</b>	<b>Configuration</b>	RGB
	<b>LCD Mode</b>	eDP 1.2	
	<b>PPI</b>	TN	
	<b>Viewing Angle</b>	157	
	<b>Active Area (W x H)</b>	SVA 45/45/25/35	
	<b>Dimensions (W x H)</b>	309.4 x 173.95 (mm)	
	<b>Weight</b>	320.9 x 205.6 (mm) max	
	<b>Surface Treatment</b>	290 g max	
	<b>Contrast Ratio</b>	Anti-Glare (AG)	
	<b>Refresh Rate</b>	300:1 (typ)	
	<b>Brightness</b>	60 Hz	
	<b>Pixel Resolution</b>	220 nits	
		<b>Format</b>	1920 x 1080 (FHD)
		<b>Configuration</b>	RGB
	<b>Backlight</b>	LED	
	<b>PPI</b>	112	
<b>Viewing Angle</b>	SVA 45/45/25/35		

### Technical Specifications – Storage

#### STORAGE AND DRIVES\*

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

### Technical Specifications – Storage

	<b>Capacity</b>	1 TB		
	<b>Height</b>	0.28 in (7 mm)		
	<b>Width</b>	2.75 in (69.85 mm)		
	<b>Interface</b>	ATA-8, SATA 3.0		
	<b>Transfer Rate</b>	<b>Synchronous (maximum)</b> 600 MB/s		
	<b>Seek Time</b>	<b>Single Track</b> 2 ms		
	<b>(typical reads, including settling)</b>	<b>Average</b> 12 ms-13 ms		
		<b>Maximum</b> 18 ms-22 ms		
	<b>Cache</b>	Up to 32MB		
	<b>Rotational Speed</b>	5400 rpm		
	<b>Logical Blocks</b>	1,953,525,168		
	<b>Operating Temperature</b>	32° to 140° F (0° to 60° C) [case temp]		
	<b>Features</b>	ATA Security, S.M.A.R.T., NCQ, Ultra DMA		
<b>500 GB Hybrid, 8 GB cache</b>	<b>Drive Weight</b>	0.198 lbs (90 g) ~ 0.20 lbs (92 g)		
	<b>Capacity</b>	500 GB		
	<b>Height</b>	0.28 in (7 mm)		
	<b>Width</b>	2.75 in (69.85 mm)		
	<b>Interface</b>	ATA-8, SATA 3.0		
	<b>Transfer Rate</b>	<b>Synchronous (maximum)</b> 600 MB/s		
	<b>Seek Time</b>	<b>Single Track</b> 1.5 ms ~ 2 ms		
	<b>(typical reads, including settling)</b>	<b>Average</b> 12 ms ~13 ms		
		<b>Maximum</b> 22 ms ~ 32 ms		
	<b>Cache</b>	Up to 128MB		
	<b>Rotational Speed</b>	5400 rpm		
	<b>Logical Blocks</b>	976,773,168		
	<b>Operating Temperature</b>	32° to 140° F (0° to 60° C) [case temp]		
<b>Features</b>	ATA Security, S.M.A.R.T., NCQ, Ultra DMA			
<b>256 GB M2 2280 SATA-3 Self-Encrypting Drive (Opal 2) TLC Solid State Drive</b>	<b>Drive Weight</b>	0.02 lb (10 g)		
	<b>Capacity</b>	256 GB		
	<b>Height</b>	0.09 in (2.23 mm)		
	<b>Width</b>	0.87 in (22 mm)		
	<b>Interface</b>	ATA-8, SATA 3.0		
	<b>Performance</b>	<b>Maximum Sequential Read</b>	Up to 530 MB/s	
		<b>Maximum Sequential Write</b>	Up to 515 MB/s	
	<b>Logical Blocks</b>	500,118,192		
	<b>Operating Temperature</b>	32° to 158°F (0° to 70°C) [ambient temp]		
	<b>Features</b>	ATA Security; TCG Opal 2.0, DIPM; TRIM; DEVSLP		
	<b>HP Z Turbo Drive 512 GB, M.2 NVMe MLC Solid State Drive</b>	<b>Drive Weight</b>	0.022 lb (10 g)	
		<b>Capacity</b>	512 GB	
		<b>Height</b>	0.09 in (2.3 mm)	
<b>Width</b>		0.87 in (22 mm)		
<b>NAND Type</b>		MLC		
<b>Form-Factor (I/O)</b>		M.2 2280		

### Technical Specifications – Storage

<b>Interface</b>	PCIe NVMe Gen3X4	
<b>Performance</b>	<b>Maximum Sequential Read</b>	<b>Maximum Sequential Write</b>
	Up to 3000 MB/s	Up to 1500MB/s
<b>Logical Blocks</b>	1,000,215,216	
<b>Operating Temperature</b>	32° to 158°F (0° to 70°C) [ambient temp]	
<b>Features</b>	ATA Security (option), TRIM; L1.2	

#### HP Z Turbo Drive 1 TB, M.2 NVMe MLC Solid State Drive

<b>Drive Weight</b>	0.02 lb (10 g)	
<b>Capacity</b>	1024 GB	
<b>Height</b>	0.09 in (2.3 mm)	
<b>Width</b>	0.87 in (22 mm)	
<b>NAND Type</b>	MLC	
<b>Form-Factor (I/O)</b>	M.2 2280	
<b>Interface</b>	PCIe NVMe Gen3X4	
<b>Drive Weight</b>	0.02 lb (10 g)	
<b>Performance</b>	<b>Maximum Sequential Read</b>	<b>Maximum Sequential Write</b>
	Up to 3,000 MB/s	Up to 2,900 MB/s
<b>Logical Blocks</b>	2,000,409,264	
<b>Operating Temperature</b>	32° to 158°F (0° to 70°C) [ambient temp]	
<b>Features</b>	ATA Security (Option),TRIM; L1.2	

#### HP Z Turbo Drive 256 GB, M.2 NVMe MLC Solid State Drive

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

### Technical Specifications – Storage

<b>HP Z Turbo Drive 256 GB, M.2 NVMe TLC Solid State Drive</b>	<b>Drive Weight</b>	0.02 lb (10 g)	
	<b>Capacity</b>	256 GB	
	<b>Height</b>	0.09 in (2.3 mm)	
	<b>Width</b>	0.87 in (22 mm)	
	<b>NAND Type</b>	TLC	
	<b>Form-Factor (I/O)</b>	M.2 2280	
	<b>Interface</b>	PCIe NVMe Gen3X4	
	<b>Performance</b>	<b>Maximum Sequential Read</b>	<b>Maximum Sequential Write</b>
		Up to 2,600 MB/s	Up to 900 MB/s
	<b>Logical Blocks</b>	500,118,192	
<b>Operating Temperature</b>	32° to 158°F (0° to 70°C) [ambient temp]		
<b>Features</b>	ATA Security (Option); TRIM; L1.2		

<b>HP Z Turbo Drive 512 GB, M.2 NVMe TLC Opal 2 Solid State Drive</b>	<b>Drive Weight</b>	0.02 lb (10 g)	
	<b>Capacity</b>	512 GB	
	<b>Height</b>	0.09 in (2.3 mm)	
	<b>Width</b>	0.87 in (22 mm)	
	<b>NAND Type</b>	M.2 2280	
	<b>Form-Factor (I/O)</b>	PCIe NVMe Gen3X4	
	<b>Interface</b>	0.02 lb (10 g)	
	<b>Performance</b>	<b>Maximum Sequential Read</b>	<b>Maximum Sequential Write</b>
		Up to 2,600 MB/s	Up to 1,400 MB/s
	<b>Logical Blocks</b>	1,000,215,216	
<b>Operating Temperature</b>	32° to 158°F (0° to 70°C) [ambient temp]		
<b>Features</b>	ATA Security (Option); TRIM; L1.2		

<b>HP Z Turbo Drive 512 GB, M.2 SATA TLC FIPS Solid State Drive</b>	<b>Drive Weight</b>	0.02 lb (10 g)	
	<b>Capacity</b>	512 GB	
	<b>Height</b>	0.09 in (2.3 mm)	
	<b>Width</b>	0.87 in (22 mm)	
	<b>Generation</b>		
	<b>NAND Type</b>	TLC	
	<b>Form-Factor (I/O)</b>	M.2 2280	
	<b>Interface</b>	ACS-3, SATA 3.2	
	<b>Performance</b>	<b>Maximum Sequential Read</b>	<b>Maximum Sequential Write</b>
		Up to 530 MB/s	Up to 400 MB/s
<b>Logical Blocks</b>	1,000,215,216		
<b>Operating Temperature</b>	32° to 158°F (0° to 70°C) [ambient temp]		
<b>Features</b>	ATA Security; TCG Opal 2.0; FIPS; DIPM; TRIM; DEVSLP		

### Technical Specifications – Storage

\* 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.

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### Technical Specifications – Security

#### SECURITY

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

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### Technical Specifications – Networking

#### NETWORKING/COMMUNICATION

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

**Ethernet Features**

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

**Power Management**

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 It4132 LTE/HSPA+ 4G Mobile Broadband Module

<b>Technology/Operating bands</b>	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
<b>Wireless protocol standards</b>	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
<b>GPS</b>	Standalone, A-GPS (MS-B and LTO)
<b>GPS bands</b>	1575.42 MHz ± 1.023 MHz, GLONASS 1596-1607MHz
<b>Maximum data rates</b>	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)
<b>Maximum output power</b>	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
<b>Maximum power consumption</b>	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)
<b>Form Factor</b>	M.2, 3042-S3 Key B
<b>Weight</b>	6 g
<b>Dimensions</b> (Length x Width x Thickness)	42 x 30 x 2.3 mm

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

#### HP hs3210 HSPA+ Mobile Broadband Module\*

<b>Technology/Operating bands</b>	HSPA+: 2100 (Band1), 1900 (Band 2), 850 (Band 5), 900 (Band 8) MHz E-GPRS: 1900 (Band 2), 1800 (Band 3), 850 MHz (Band 5), 900 (Band 8) MHz
<b>Wireless protocol standards</b>	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
<b>Maximum data rates</b>	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)
<b>Maximum output power</b>	HSPA+: 24 dBm E-GPRS 1800/1900: 26 dBm E-GPRS 850/900: 27 dBm

### Technical Specifications – Networking

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

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

### HP It4120 Qualcomm® Snapdragon™ X5 LTE Mobile Broadband Module

<b>Technology/Operating bands</b>	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
<b>Wireless protocol standards</b>	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
<b>GPS</b>	Standalone, A-GPS (MS-A, MS-B and XTRA)
<b>GPS bands</b>	1575.42 MHz ± 1.023 MHz, GLONASS 1596-1607MHz
<b>Maximum data rates</b>	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)
<b>Maximum output power</b>	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
<b>Maximum power consumption</b>	LTE: 1,200 mA (peak); 900 mA (average) HSPA+: 1,100 mA (peak); 800 mA (average) 1xRTT/EVDO: 1,000 mA (peak); 700 mA (average) E-GPRS: 2,800 mA (peak); 500 mA (average)
<b>Form Factor</b>	M.2, 3042-S3 Key B
<b>Weight</b>	6.2 g

### Technical Specifications – Networking

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

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

**Wireless LAN Standards**

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

**Interoperability**

Wi-Fi certified

**Frequency Band**

802.11b/g/n

2.402 - 2.482 GHz

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

802.11a

4.9 - 4.95 GHz (Japan)

5.15 - 5.25 GHz

5.25 - 5.35 GHz

5.47 - 5.725 GHz

5.825 - 5.850 GHz

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

**Data Rates**

- 802.11a: 6, 9, 12, 18, 24, 36, 48, 54 Mbps
- 802.11b: 1, 2, 5.5, 11 Mbps
- 802.11g: 6, 9, 12, 18, 24, 36, 48, 54 Mbps
- 802.11n: MCS 0 ~ MCS 15, (20MHz, and 40MHz)
- 802.11ac : MCS0 ~ MCS9, (1SS, and 2SS) (20MHz, 40MHz, and 80MHz)

**Modulation**

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

**Security<sup>1</sup>**

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

**Network Architecture Models**

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

**Roaming**

IEEE 802.11 compliant roaming between band Access Points

**Output Power<sup>2</sup>**

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

### Technical Specifications – Networking

	<ul style="list-style-type: none"> <li>802.11n HT20(5GHz) : +12dBm minimum</li> <li>802.11n HT40(5GHz) : +12dBm minimum</li> </ul>
<b>Power Consumption</b>	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
<b>Power Management</b>	ACPI and PCI Express compliant power management 802.11 compliant power saving mode
<b>Receiver Sensitivity<sup>3</sup></b>	802.11b, 1Mbps : -94dBm maximum 802.11b, 11Mbps : -86dBm maximum 802.11g, 6Mbps : -88dBm maximum 802.11g, 54Mbps : -74dBm maximum 802.11a, 6Mbps : -88dBm maximum 802.11a, 54Mbps : -74dBm maximum 802.11n, MCS07 : -69dBm maximum 802.11n, MCS15 : -66dBm maximum 802.11ac, 1SS, MCS-0 : -86dBm maximum 802.11ac, 1SS, MCS-9 : -61dBm maximum 802.11ac, 2SS, MCS-0 : -83dBm maximum 802.11ac, 2SS, MCS-9 : -58dBm maximum
<b>Antenna Type</b>	High efficiency antenna with spatial diversity, mounted in the display enclosure Two embedded dual band 2.4/5 GHz antennas are provided to the card to support WLAN MIMO and Bluetooth communications
<b>Form Factor</b>	PCI-Express M.2 MiniCard
<b>Dimensions</b>	Type 2230 : 2.3 x 22.0 x 30.0 mm Or Type 1630 : 2.3 x 16.0 x 30.0 mm
<b>Weight</b>	Type 2230 : 2.8g Or Type 1630 : 2g
<b>Operating Voltage</b>	3.3v +/- 9%
<b>Temperature</b>	Operating 14° to 158° F (-10° to 70° C) Non-operating -40° to 176° F (-40° to 80° C)
<b>Humidity</b>	Operating 10% to 90% (non-condensing) Non-operating 5% to 95% (non-condensing)
<b>Altitude</b>	Operating Non-operating 0 to 10,000 ft (3,048 m) 0 to 50,000 ft (15,240 m)
<b>LED Activity</b>	LED Amber – Radio OFF; LED White – Radio ON

### Technical Specifications – Networking

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

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### 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

**Security<sup>1</sup>**

- 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<sup>2</sup>**

- 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

<b>Power Consumption</b>	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
<b>Power Management</b>	ACPI and PCI Express compliant power management 802.11 compliant power saving mode
<b>Receiver Sensitivity<sup>3</sup></b>	802.11g:-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)
<b>Antenna type</b>	High efficiency antenna with spatial diversity, mounted in the display enclosure Two embedded dual band 2.4/5 GHz antennas are provided to the card to support WLAN MIMO communications and Bluetooth communications
<b>Form Factor</b>	PCI-Express Half-MiniCard
<b>Dimensions</b>	0.134 x 1.06 x 1.18 in (3.4 x 26.8 x 30 mm)
<b>Weight</b>	3.1g
<b>Operating Voltage</b>	3.3v +/- 9%
<b>Temperature</b>	Operating 14° to 158° F (-10° to 70° C) Non-operating -40° to 176° F (-40° to 80° C)
<b>Humidity</b>	Operating 10% to 90% (non-condensing) Non-operating 5% to 95% (non-condensing)
<b>Altitude</b>	Operating 0 to 10,000 ft. (3,048 m) Non-operating 0 to 50,000 ft. (15,240 m)
<b>LED Activity</b>	LED Amber - Radio OFF; LED White - Radio ON

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

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

<b>Bluetooth Specification</b>	4.0+EDR Compliant
<b>Frequency Band</b>	2402 to 2480 MHz
<b>Number of Available Channels</b>	79 (1 MHz) available channels
<b>Data Rates and Throughput</b>	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
<b>Transmit Power</b>	The Bluetooth component shall operate as a Class II Bluetooth device with a maximum transmit power of +4 dBm for BR and EDR
<b>Receiver Sensitivity</b>	Better than -20 dBm at 0.1 % raw bit error rate
<b>Power Consumption</b>	Peak (Tx) 330 mW Peak (Rx) 230 mW Selective Suspend 17 mW
<b>Antenna</b>	Internally integrated within module
<b>Range</b>	Up to 33 ft. (10 m)
<b>Electrical Interface</b>	USB 2.0 compliant Microsoft Windows Plug and Play compliant
<b>Bluetooth® Software Supported</b>	Broadcom Bluetooth for Windows Microsoft Windows Bluetooth Software
<b>Link Topology</b>	Point to Point, Multipoint Pico Nets up to 7 slaves
<b>Security</b>	Full support of Bluetooth Security Provisions
<b>Power Management</b>	Microsoft Windows ACPI, and USB Bus Support Self-configurable to optimize power conservation in all operating modes, including Standby, Hold, Park, and Sniff
<b>Certifications</b>	All necessary regulatory approvals for supported countries, including: FCC (47 CFR) Part 15C, Section 15.247 & 15.249 ETS 300 328, ETS 300 826 Low Voltage Directive IEC950 UL, CSA, and CE Mark
<b>Bluetooth® Profiles Supported</b>	Serial Port Profile (SPP) <sup>1</sup> Service Discovery Application Profile (SDAP) Dial-Up Networking (DUN) <sup>1,2</sup> Generic Object Exchange Profile (GOEP) <sup>1,2</sup> Object Push Profile (OPP) <sup>1,2</sup> File Transfer Profile (FTP) Synchronization Profile (SYNC) Hard Copy Cable Replacement (HCRP) <sup>1,2</sup> Personal Area Networking Profile (PAN) <sup>1,2</sup> Human Interface Device Profile (HID) <sup>1,2</sup> FAX Profile (FAX) Basic Imaging Profile (BIP) <sup>2</sup> 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><b>Intel® Dual Band Wireless-AC 3168 802.11 ac (1x1) WiFi and Bluetooth® 4.2 Combo Adapter (non-vPro)</b></p>	<p><b>Wireless LAN Standards</b></p>	<p>IEEE 802.11a IEEE 802.11b IEEE 802.11g IEEE 802.11n IEEE 802.11ac</p>
	<p><b>Interoperability</b></p>	<p>Wi-Fi certified</p>
	<p><b>Frequency Band</b></p>	<p>802.11b/g/n</p> <ul style="list-style-type: none"> <li>• 2.402 – 2.482 GHz</li> </ul>
		<p><b>Note:</b> The FCC has declared as of January 1, 2015 products that utilize passive scanning on channel 12/13 and are capable of transmitting must fully comply with requirements of 15.247 or otherwise disable those channels.</p>
		<p>802.11a/n</p> <ul style="list-style-type: none"> <li>• 4.9 – 4.95 GHz (Japan)</li> <li>• 5.15 – 5.25 GHz</li> <li>• 5.25 – 5.35 GHz</li> <li>• 5.47 – 5.725 GHz</li> <li>• 5.825 – 5.850 GHz</li> </ul>
	<p><b>Data Rates</b></p>	<p><b>Note:</b> Indonesia only supports 5.725 - 5.825 GHz (CH149 - CH161)</p> <ul style="list-style-type: none"> <li>• 802.11b: 1, 2, 5.5, 11 Mbps</li> <li>• 802.11g: 6, 9, 12, 18, 24, 36, 48, 54 Mbps</li> <li>• 802.11a: 6, 9, 12, 18, 24, 36, 48, 54 Mbps</li> <li>• 802.11n: MCS 0 ~ MCS 15, (20MHz, and 40MHz)</li> <li>• 802.11ac : MCS0 ~ MCS7, (1SS) (20MHz, 40MHz, and 80MHz)</li> </ul>
	<p><b>Modulation</b></p>	<p>Direct Sequence Spread Spectrum BPSK, QPSK, CCK, 16-QAM, 64-QAM, 256-QAM</p>
	<p><b>Security<sup>1</sup></b></p>	<ul style="list-style-type: none"> <li>• IEEE and Wi-Fi compliant 64 / 128 bit WEP encryption for a/b/g mode only</li> <li>• AES-CCMP: 128 bit in hardware</li> <li>• 802.1x authentication</li> <li>• WPA, WPA2: 802.1x. WPA-PSK, WPA2-PSK, TKIP, and AES.</li> <li>• WPA2 certification</li> <li>• IEEE 802.11i</li> <li>• Cisco Certified Extensions, all versions through CCX4 and CCX Lite</li> <li>• WAPI</li> </ul>
	<p><b>Network Architecture Models</b></p>	<p>Ad-hoc (Peer to Peer) Infrastructure (Access Point Required)</p>
	<p><b>Roaming</b></p>	<p>IEEE 802.11 compliant roaming between access points</p>
	<p><b>Output Power<sup>2</sup></b></p>	<ul style="list-style-type: none"> <li>• 802.11b : +16dBm minimum</li> <li>• 802.11g : +14dBm minimum</li> <li>• 802.11a : +14dBm minimum</li> <li>• 802.11n HT20(2.4GHz) : +13dBm minimum</li> <li>• 802.11n HT40(2.4GHz) : +13dBm minimum</li> <li>• 802.11n HT20(5GHz) : +12dBm minimum</li> <li>• 802.11n HT40(5GHz) : +12dBm minimum</li> <li>• 802.11ac 80MHz(5GHz) : +11dBm minimum</li> </ul>
	<p><b>Power Consumption</b></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
<b>Power Management</b>	ACPI and PCI Express compliant power management 802.11 compliant power saving mode
<b>Receiver Sensitivity<sup>3</sup></b>	802.11b, 1Mbps : -94dBm maximum 802.11b, 11Mbps : -86dBm maximum 802.11g, 6Mbps : -88dBm maximum 802.11g, 54Mbps : -74dBm maximum 802.11a, 6Mbps : -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
<b>Antenna type</b>	High efficiency antenna with spatial diversity, mounted in the display enclosure Two embedded dual band 2.4/5 GHz antennas are provided to the card to support WLAN MIMO communications and Bluetooth communications
<b>Form Factor</b>	PCI-Express M.2 MiniCard
<b>Dimensions</b>	Type 2230 : 2.3 x 22.0 x 30.0 mm Or Type 1630 : 2.3 x 16.0 x 30.0 mm
<b>Weight</b>	Type 2230 : 2.8g Or Type 1630 : 2g
<b>Operating Voltage</b>	3.3v +/- 9%
<b>Temperature</b>	Operating 14° to 158° F (-10° to 70° C) Non-operating 40° to 176° F (-40° to 80° C)
<b>Humidity</b>	Operating 10% to 90% (non-condensing) Non-operating 5% to 95% (non-condensing)
<b>Altitude</b>	Operating 0 to 10,000 ft (3,048 m) Non-operating 0 to 50,000 ft (15,240 m)

### Near Field Communications (NFC)

<b>Controller</b>	HP Module with NXP NFC Controller NPC100
<b>Supports</b>	<ul style="list-style-type: none"> <li>• Windows 8, Proximity Events</li> <li>• Windows 7, PC/SC</li> <li>• NFC Forum Compliant</li> <li>• Near Field Communications Controller</li> </ul>
<b>Dimensions</b> (L x W x H)	Module 25 mm by 10 mm by 2.0 mm
<b>Chipset</b>	NPC100
<b>System interface</b>	I2C
<b>NFC RF standards</b>	standards ISO/IEC 14443 A ISO/IEC 14443 B ISO/IEC 15693 ISO/IEC 18092 ECMA-340 NFCIP-1 Target and Initiator ECMA-320 NFCIP-2

### Technical Specifications – Networking

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

### Technical Specifications – Audio

#### AUDIO/MULTIMEDIA – BANG & OLUFSEN

<b>Hardware</b>	<b>Implementation</b>	Conexant CX7501
	<b>Function Key</b>	Volume up, volume down, and mute
	<b>Volume Controls</b>	
	<b>Line In/Line Out</b>	Yes, via dock
	<b>Headphone/Microphone in</b>	Yes combo jack
	<b>Integrated Microphone</b>	Yes, dual digital microphone array when equipped with optional webcam

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<b>Audio Output Quality</b>	<b>Frequency Response</b>	20 Hz - 20 kHz
	<b>Signal to Noise Ratio</b>	>85 dB
	<b>Total Harmonic Distortion</b>	0.01%
	<b>Noise Floor</b>	-110 dB
	<b>Play/Record Sampling Rate(s)</b>	8 kHz – 48kHz
	<b>DAC</b>	16, 20 or 24-bit
	<b>ADC</b>	16,20-bit

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<b>Integrated Stereo Speakers</b>	<b>Power Rating</b>	2 Watts
	<b>Impedance</b>	4 Ohms

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### Technical Specifications – Power

#### POWER

<b>HP 65W Smart AC Adapter</b>	<b>Dimensions</b>	107.0x47.0x30.0mm	
	<b>Weight</b>	unit: 250g +/- 10g	
	<b>Input</b>	90 to 265 VAC	
		<b>Input Efficiency</b>	88.0 % at 115 Vac and 89.0 % at 230 Vac
		<b>Input frequency range</b>	47 to 63 Hz
		<b>Input AC current</b>	1.7 A at 90 Vac
	<b>Output</b>	<b>Output power</b>	65W
		<b>DC output</b>	19.5V
		<b>Hold-up time</b>	5 ms at 115 Vac input
		<b>Output current limit</b>	<11.0A
	<b>AC Connector (Ac Inlet)</b>	C6 (3pin/with grounded, with Smart ID DC connector)	
	<b>AC Connector (Ac Inlet) Environmental Design</b>	<b>Operating temperature</b>	32° to 95° F (0° to 35° C)
		<b>Non-operating (storage) temperature</b>	-4° to 185° F (-20° to 85° C)
		<b>Altitude</b>	0 to 16,400 ft (0 to 5,000 m)
		<b>Humidity</b>	20% to 95%
	<b>Storage Humidity</b>	10% to 95%	
<b>EMI and Safety Certifications</b>	<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>		

<b>HP 65W Smart AC Adapter EM</b>	<b>Dimensions</b>	102.0x55.0x30.0mm	
	<b>Weight</b>	unit: 350g +/- 10g	
	<b>Input</b>	90 to 265 VAC	
		<b>Input Efficiency</b>	87.0% min at 115 VAC and 230Vac
		<b>Input frequency range</b>	47 to 63 Hz
		<b>Input AC current</b>	1.7 A at 90 VAC
	<b>Output</b>	<b>Output power</b>	65W
		<b>DC output</b>	19.5V
		<b>Hold-up time</b>	5 ms at 115 Vac input
		<b>Output current limit</b>	<11.0A
<b>AC Connector (Ac Inlet)</b>	C6 (3pin/with grounded, with Smart ID DC connector)		

### Technical Specifications – Power

<b>AC Connector (Ac Inlet) Environmental Design</b>	<b>Operating temperature</b>	32° to 95° F (0° to 35° C)
	<b>Non-operating (storage) temperature</b>	-4° to 185° F (-20° to 85° C)
	<b>Altitude</b>	0 to 16,400 ft (0 to 5,000 m)
	<b>Humidity</b>	20% to 95%
	<b>Storage Humidity</b>	10% to 95%
<b>EMI and Safety Certifications</b>	<p>*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.</p>	

<b>HP 65W Travel AC Adapter</b>	<b>Dimensions</b>	120.0x57.6x16.7mm	
	<b>Weight</b>	unit: 250g +/- 10g	
	<b>Input</b>	<b>Input Efficiency</b>	88.0 % at 115 Vac and 89.0 % at 230Vac
		<b>Input frequency range</b>	47 to 63 Hz
		<b>Input AC current</b>	1.7 A at 90 Vac
	<b>Output</b>	<b>Output power</b>	65W
		<b>DC output</b>	19.5V/5V
		<b>Hold-up time</b>	5 ms at 115 Vac input
		<b>Output current limit</b>	<11.0A
	<b>DC Plug</b>	4.5mm/7.4mm tips	
	<b>Environmental Design</b>	<b>Operating temperature</b>	32° to 95° F (0° to 35° C)
		<b>Non-operating (storage) temperature</b>	-4° to 185° F (-20° to 85° C)
		<b>Altitude</b>	0 to 16,400 ft (0 to 5,000 m)
		<b>Humidity</b>	20% to 95%
<b>Storage Humidity</b>		10% to 95%	
<b>EMI and Safety Certifications</b>	<p>*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.</p>		

### Technical Specifications – Power

<b>HP Long Life 3-cell Polymer Battery (51WHr)</b>	<b>Dimensions (H x W x L)</b>	6.8mm x 102.8mm x 198mm	
	<b>Weight</b>	235 g	
	<b>Cells/Type</b>	3cell Lithium-Ion Polymer cell / 506480	
	<b>Energy</b>	Voltage	11.55V
		Amp-hour capacity	4420mAh
		Watt-hour capacity	51wh
	<b>Temperature</b>	Operating (Charging)	32° to 113° F (0° to 45° C)
		Operating (Discharging)	14° to 140° F(-10° to 60° C)
	<b>Fuel Gauge LED</b>	No	
	<b>Warranty</b>	1000 cycles > 65% (at 23 °C)	
	<b>Optional Travel Battery Available</b>	No	

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### Technical Specifications – Environmental

#### ENVIRONMENTAL DATA

##### Eco-Label Certifications & declarations

This product has received or is in the process of being certified to the following approvals and may be labeled with one or more of these marks:

- IT ECO declaration
- US ENERGY STAR®
- EPEAT<sup>1</sup> 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, 50Hz
Normal Operation (Short idle)	8.24 W	8.11 W	7.97 W
Normal Operation (Long idle)	3.95 W	3.41 W	3.46 W
Sleep	0.85 W	0.88 W	0.85 W
Off	0.50 W	0.53 W	0.50 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)	28 BTU/hr	28 BTU/hr	27 BTU/hr
Normal Operation (Long idle)	14 BTU/hr	12 BTU/hr	12 BTU/hr
Sleep	3 BTU/hr	3 BTU/hr	3 BTU/hr
Off	2 BTU/hr	2 BTU/hr	2 BTU/hr

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

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

	Sound Power (L <sub>WAd</sub> , bels)	Sound Pressure (L <sub>pAm</sub> , decibels)
Typically Configured – Idle	2.9	16
Fixed Disk – Random writes	3.3	22

##### 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

### Technical Specifications – Environmental

- 2 SODIMM memory slots
- Optional expansion base docking station
- 1 multi-bay II storage port
- Interchangeable HDD??

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 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](http://www.epeat.net)
- Plastics parts weighing over 25 grams used in the product are marked per ISO11469 and ISO1043.
- This product contains 7.8% post-consumer recycled plastic (by wt.)
- This product is 96.1% recycle-able when properly disposed of at end of life.

#### Packaging Materials

<b>External:</b>	PAPER/Corrugated	357 g
<b>Internal:</b>	PLASTIC/Polyethylene Expanded - EPE	66 g
	PLASTIC/Polypropylene - PP	4 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

### Technical Specifications – Environmental

- Nickel – finishes must not be used on the external surface designed to be frequently handled or carried by the user.
- Ozone Depleting Substances
- Polybrominated Biphenyls (PBBs)
- Polybrominated Biphenyl Ethers (PBBEs)
- Polybrominated Biphenyl Oxides (PBBOs)
- Polychlorinated Biphenyl (PCB)
- Polychlorinated Terphenyls (PCT)
- Polyvinyl Chloride (PVC) – except for wires and cables, 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://h20195.www2.hp.com/V2/GetDocument.aspx?docname=c04755842>

and

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

#### Country of Origin

China

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

Type	Description	Part #
<b>Memory</b>	HP 4GB DDR4-2400 SODIMM (Core processors only)	Z4Y84AA
	HP 16GB DDR4-2400 SODIMM (Core processors only)	Z4Y86AA
<b>Cases</b>	HP Executive 15.6 Black Top Load	P6N18AA
	HP Business Case (up to 15.6")	H5M92AA
<b>Docking</b>	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
<b>Input/Output - Mice</b>	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	
<b>Power Adapters</b>	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
<b>Battery</b>	HP TA03XL Rechargeable Battery	1FN06AA
<b>Adapters</b>	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
	DisplayPort™ to DVI Adapter	F7W96AA

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

	DisplayPort™ to VGA	F7W97AA
	DisplayPort™ to HDMI 1.4 Adapter	F3W43AA
<b>Wireless</b>	HP Lt4120 LTE/EVDO/HSPA+ Gobi™ 4G Mobile Broadband Module	TBD
<b>Collaboration</b>	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
<b>Storage - External Storage</b>	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
<b>Security</b>	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

<b>Date of change:</b>	<b>Version History:</b>		<b>Description of change:</b>
February 15, 2018	From v1 to v2	Change	Environmental data updated

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