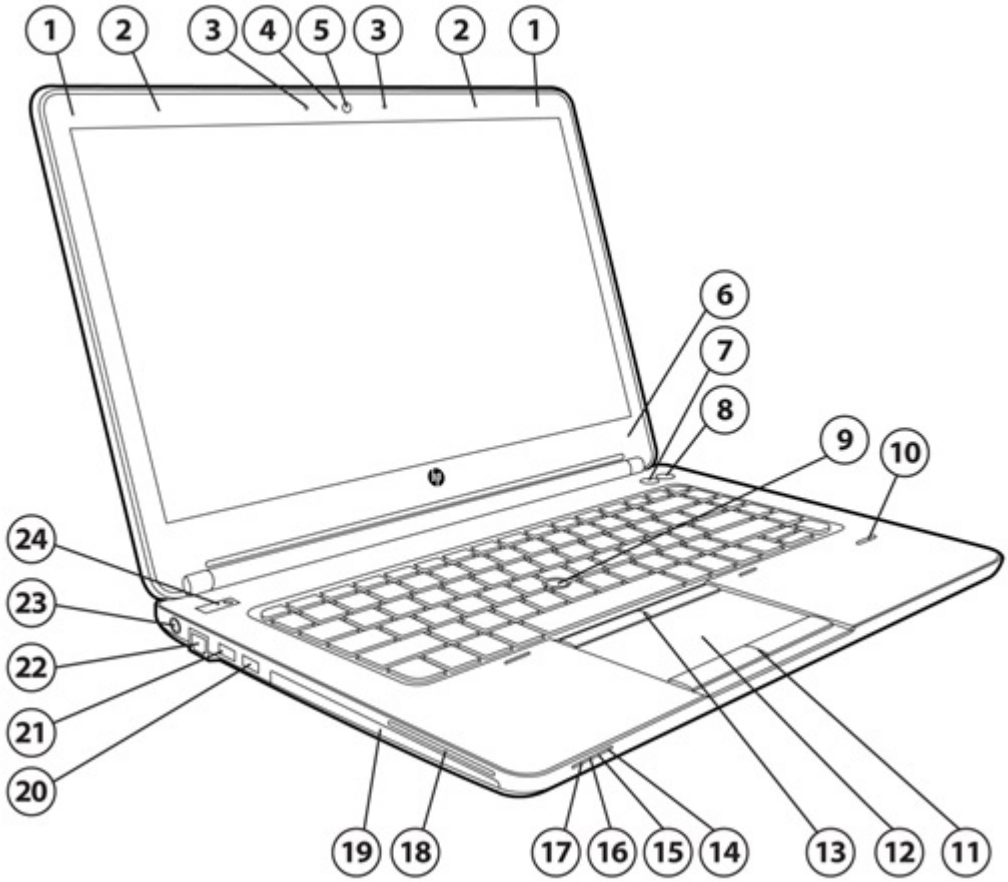
HP ProBook 645 G1 Notebook PC



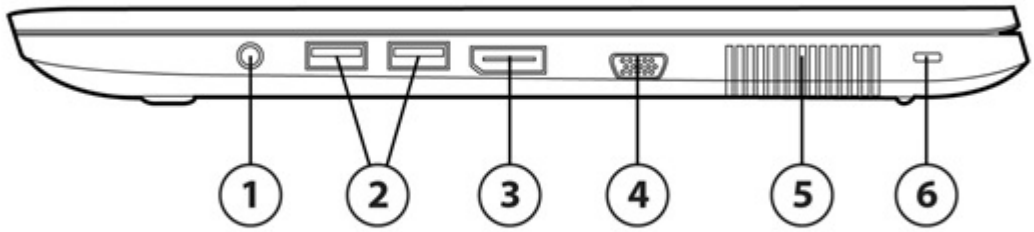
Front/Left

1. WLAN antennas (2)*
2. WWAN antennas (2)*
3. Internal microphone array (2)**
4. Webcam light (select models only)
5. Webcam (select models only)
6. Internal display switch
7. Wireless button
8. Volume mute button
9. Pointing stick (select models only)
10. Fingerprint reader
11. Touchpad buttons
12. Touchpad zone
13. Pointing stick buttons (select models only)
14. Hard drive light
15. AC adapter/Battery light
16. Power light
17. Wireless light
18. Smart Card Reader
19. Optical Drive (select models only)
20. USB 3.0 port (1)
21. USB 3.0 charging port (1)
22. RJ-45 (network) jack/lights
23. Power connector
24. Power button

* The antennas are not visible from the outside of the computer. For optimal transmission, keep the areas immediately around the antennas free from obstructions.

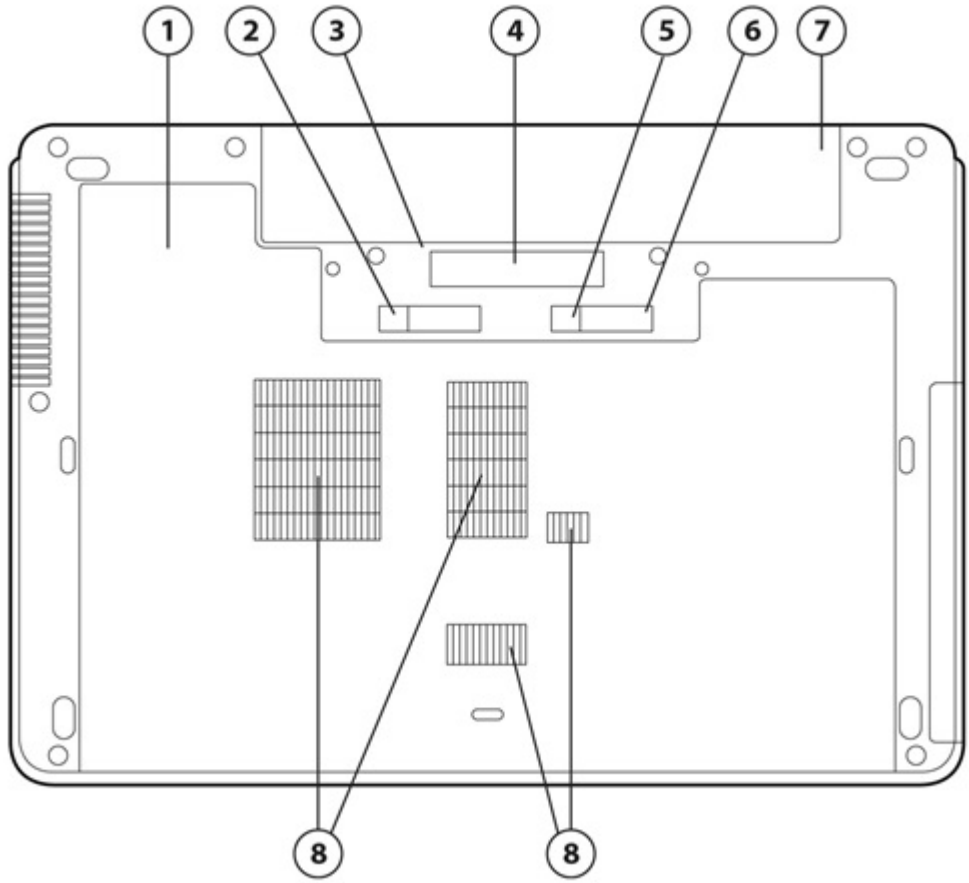
** Models without optional webcam have single integrated microphone on left side of display panel.

Overview



Right

1. Audio-out (headphone) jack/Audio-in (microphone) jack
2. USB 3.0 ports (2)
3. DisplayPort 1.2
4. External VGA monitor port
5. Vents (2)
6. Security cable slot

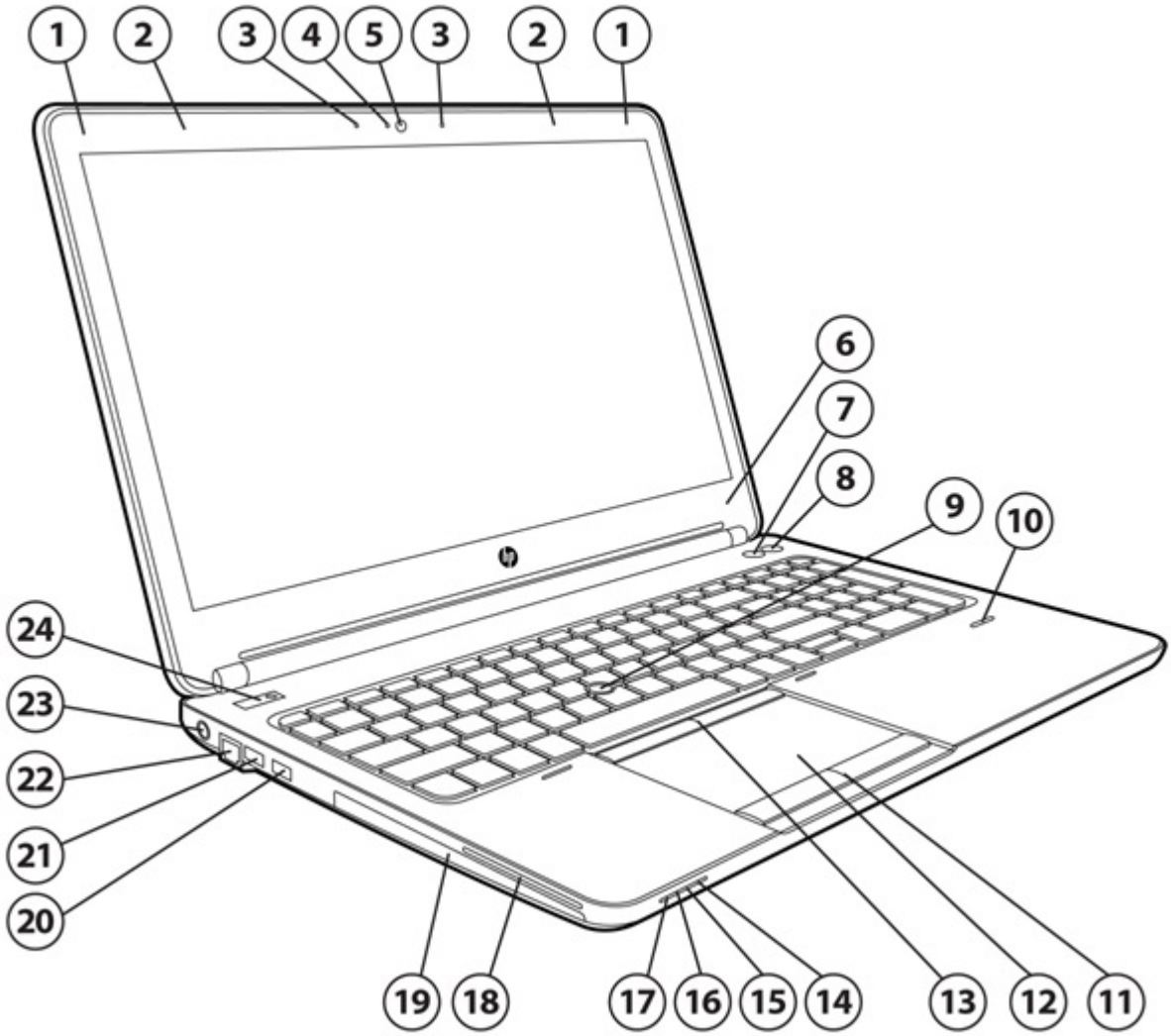


Bottom

Overview

1. Service cover
2. Battery release latch
3. SIM card slot
4. Docking connector
5. Service cover release lock
6. Service door release latch
7. Battery bay
8. Vents

HP ProBook 655 G1 Notebook PC



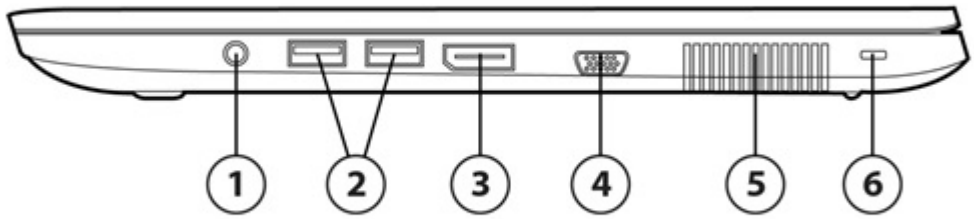
Front/Left

1. WLAN antennas (2)*
2. WWAN antennas (2)*
3. Internal dual-microphone array (2)**
4. Webcam light (select models only)
5. Webcam (select models only)
6. Internal display switch
7. Wireless button
13. Pointing stick buttons (select models only)
14. Hard drive light
15. AC adapter/Battery light
16. Power light
17. Wireless light
18. Smart Card Reader
19. Upgrade bay (optical drive shown)Optical Drive (select models only

Overview

8. Volume mute button
9. Pointing stick (select models only)
10. Fingerprint reader (select models only)
11. Touchpad buttons
12. Touchpad zone
20. USB 3.0 ports (1)
21. USB 3.0 charging port (1)
22. RJ-45 (network) jack/lights
23. Power connector
24. Power button

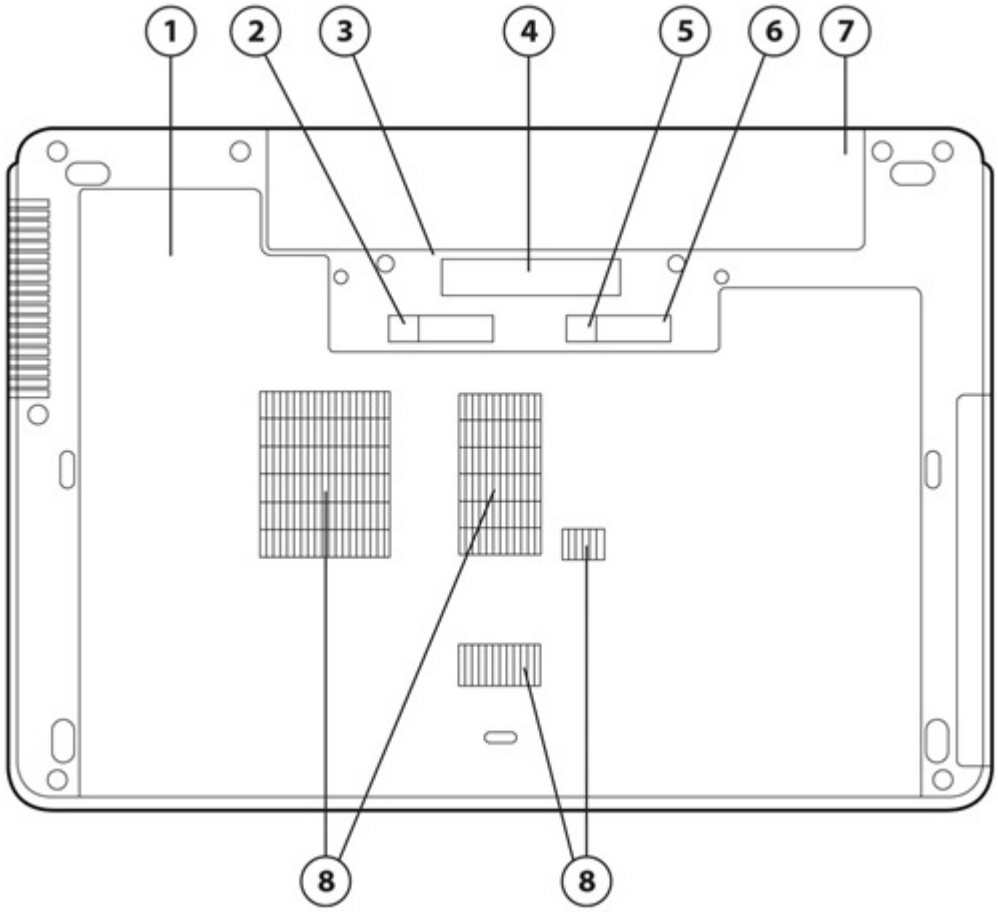
* The antennas are not visible from the outside of the computer. For optimal transmission, keep the areas immediately around the antennas free from obstructions.
** Models without optional webcam have single integrated microphone on left side of display panel.



Right

1. Audio-out (headphone) jack/Audio-in (microphone) jack
2. USB 3.0 ports (2)
3. DisplayPort 1.2
4. External VGA monitor port
5. Vents (2)
6. Security cable slot

Overview



Bottom

1. Service cover
2. Battery release latch
3. SIM card slot
4. Docking connector
5. Service cover release lock
6. Service door release latch
7. Battery bay
8. Vents

Overview

At A Glance

- Windows 8 versions, Windows 7 versions, or FreeDOS 2.0
- New thinner and lighter design - PC-ABS (Polycarbonate-Acrylnitrile/Butadiene/Styrene) durable material is nearly 20% thinner than previous generation; soft-touch, more durable 4-step paint process; larger buttons (power), revamped keyboard (arrow keys); latch/hook removal for clean palmrest design; top mounted speakers for optimized audio experience
- Full-sized spill-resistant keyboard; full separate numeric keypad (HP ProBook 655 only)
- Larger Touchpad with gestures support, on/off button with LED indicator
- New User Experience Software: HP ePrint, HP Wireless Hotspot (Win 8 only), HP PageLift, HP Trust Circles, HP Mobile Connect (EMEA only)
- Enhanced security features including HP Client Security, new HP Trust Circles and HP Fingerprint Reader
- Accelerated Processing Unit and graphics from AMD
- LED-backlit display
  - HP ProBook 645: 14.0-inch diagonal HD, HD+
  - HP ProBook 655: 15.6-inch diagonal HD or FHD
- Optional HD webcam with dual-microphone array for video conferencing
- DisplayPort 1.2 now native with integrated graphics
- Four USB 3.0 ports for fast data transfer from devices (1 charging)
- HD Audio with DTS Sound+ optimized for high fidelity audio
- Wireless and speaker mute button to conveniently manage the connectivity and speaker.
- Flexible wireless connectivity options:
  - HP Connection Manager allows full control over wireless connections, including 3G and 4G mobile broadband, Wi-Fi, Ethernet and Bluetooth® (Win 7 only)
  - HP Mobile Connect (EMEA Only) (Win 8 Only)
  - Integrated 4G HP Mobile Broadband Modules
  - Integrated 802.11 b/g/n wireless LAN module
  - Integrated 802.11 a/b/g/n with Bluetooth 4.0 High Speed combo card (Linux support Bluetooth 2.1 only)
  - HP Wireless Hotspot (Win 8 Only)
- Choice of 7200 rpm user-removable hard drive (up to 500 GB) with HP 3D DriveGuard, 256 GB SED Solid State Drive, or 128/180 GB Solid State Drive

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

PRODUCT NAMES

HP ProBook 645 G1 Notebook PC
HP ProBook 655 G1 Notebook PC

OPERATING SYSTEM

Preinstalled

Windows 8 64*
Windows 8 Pro 64*
Windows 7 Professional 32 (available through downgrade rights from Windows 8 Pro 32)**
Windows 7 Professional 64 (available through downgrade rights from Windows 8 Pro 64)**
Windows 7 Professional 32 ***
Windows 7 Professional 64***
Windows 7 Home Premium 32***
Windows 7 Home Premium 64***
FreeDOS 2.0

* Not all features are available in all editions of Windows 8. Systems may require upgraded and/or separately purchased hardware, drivers and/or software to take full advantage of Windows 8 functionality. See http://www.microsoft.com for details.
** This system is preinstalled with Windows® 7 Pro software and also comes with a license and media for Windows 8 Pro software. You may only use one version of the Windows software at a time. Switching between versions will require you to uninstall one version and install the other version. You must back up all data (files, photos, etc.) before uninstalling and installing operating systems to avoid loss of your data.
*** Not all features are available in all editions of Windows 7. This system may require upgraded and/or separately purchased hardware to take full advantage of Windows 7 functionality. See http://www.microsoft.com/windows/windows-7/ for details.

ACCELERATED PROCESSING UNIT

AMD Elite Quad-Core A10-5750M APU (2.5 GHz, 4 MB cache) with AMD Radeon™ HD 8650G Graphics
AMD Elite Quad-Core A8-4500M APU (1.9 GHz, 4 MB cache) with AMD Radeon™ HD 7640G Graphics
AMD Elite A6-4400M APU (2.7 GHz, 1 MB cache, 2 cores) with AMD Radeon™ HD 7520G Graphics
AMD Elite A4-4300M APU(2.5 GHz, 1 MB cache, 2 cores) with AMD Radeon™ HD 7420G Graphics

NOTE: AMD Radeon™ Dual Graphics requires an AMD "A" series APU plus an AMD Radeon™ discrete graphics configuration.
AMD Dynamic Switchable Graphics technology requires either an AMD "A" series APU or an Intel processor, plus an AMD Radeon™ discrete graphics configuration and is available on Windows 8 Pro, Windows 8, Windows® 7 Professional, Home Premium, and/or Home Basic OS.
NOTE: With AMD Dynamic Switchable Graphics technology, full enablement of all discrete graphics video and display features may not be supported on all systems (e.g. OpenGL applications will run on the integrated GPU or the APU as the case may be).
NOTE: Processor speed denotes maximum performance mode; processors will run at lower speeds in battery optimization mode.

FUSION CONTROLLER HUB (FCH)

AMD A76M FCH

Features

GRAPHICS

Integrated graphics:
AMD Elite Quad-Core A10-5750M Accelerated Processor with AMD Radeon™ HD 8650G Graphics
AMD Elite Quad-Core A8-4500M Accelerated Processor with AMD Radeon™ HD 7640G Graphics
AMD Elite A6-4400M Accelerated Processor with AMD Radeon™ HD 7520G Graphics
AMD Elite A4-4300M Accelerated Processor with AMD Radeon™ HD 7420G Graphics

NOTE: Processor speed denotes maximum performance mode; processors will run at lower speeds in battery optimization mode.

DISPLAY

HP ProBook 645

Internal
14" diagonal LED-backlit HD anti-glare (1366 x 768)
14" diagonal LED-backlit HD+ anti-glare (1600 x 900)
External
Up to 32-bit per pixel color depth
VGA
Port supports resolutions up to 1920 x 1200 external resolution @75 Hz
DisplayPort 1.2
Supports resolutions up to 2560 x 1600, 30-bit color depth at 60 Hz, and full HD (1920 x 1080) monitors, 24-bit color depth at 120 Hz
DVI-D (single link)
Video signal available through DVI port in optional HP Docking Station (sold separately)
supports resolutions up to 1600 x 1200 at both full and reduced blanking, and 1920 x 1200 at reduced blanking

Number of Displays Supported

# Displays with HP Advanced Docking Station	UMA	Discrete
ProBook 645 with A10	4	n/a

NOTE: HD content required to view HD images.
NOTE: Resolutions are dependent upon monitor capability, and resolution and color depth settings.

HP ProBook 655
sd
Internal
15.6" diagonal LED-backlit HD anti-glare (1366 x 768)
15.6"diagonal LED-backlit FHD anti-glare slim (1920 x 1080)
External
Up to 32-bit per pixel color depth
VGA
Port supports resolutions up to 1920 x 1200 external resolution @75 Hz
DisplayPort 1.2
Supports resolutions up to 2560 x 1600, 30-bit color depth at 60 Hz, and full HD (1920 x 1080) monitors, 24-bit color depth at 120 Hz
DVI-D (single link)

Features

Video signal available through DVI port in optional HP Docking Station (sold separately)
supports resolutions up to 1600 x 1200 at both full and reduced blanking, and 1920 x 1200 at reduced blanking

Number of Displays Supported

# Displays with HP Advanced Docking Station	UMA	Discrete
ProBook 655 with A10	4	n/a

NOTE: HD content required to view HD images.
NOTE: Resolutions are dependent upon monitor capability, and resolution and color depth settings.

STORAGE AND DRIVES

Primary Storage Bay
Hard Drives*
320/500 GB 7200 rpm SMART SATA II HDD

Solid State Drive*
128/180 GB 2.5" Solid State Drive
256 GB SED Solid State Drive

HP 3D DriveGuard (Windows only)
The hard drive is mounted directly to the notebook frame, reducing the transmission of shock to the hard drive

*For hard drives and solid state drives, GB = 1 billion bytes. Actual formatted capacity is less. Up to 16 GB (for Windows 7) and 36 GB (for Windows 8) of system disk is reserved for the system recovery software.
** FIPS-certified, hardware-based AES-256 encryption image

NOTE: For Solid State Drives (SSD), GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 5GB for Windows 8 is reserved for system recovery software.

OPTICAL DRIVES

Fixed 9.5 mm Serial ATA Upgrade Bay
DVD+/-RW SuperMulti DL Drive
DVD-ROM Drive

Weight saver

Features

MEMORY

Standard
DDR 3L PC3L-12800 (1600 MHz)
Two SODIMM slots supporting dual-channel memory
4 GB and 8 GB SODIMMs*
Maximum
Upgradeable to 16384 MB with optional 8192 MB SODIMMs in slots 1 and 2
Dual-channel
Maximized dual-channel performance requires SODIMMs of the same size and speed in both memory slots.

* 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

Wireless

Support for a broad range of 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) and can be combined with any of the supported wireless LAN and wireless WAN options.

Broadband Wireless (WWAN)

HP hs3110 HSPA+ Mobile Broadband Module*
HP lt4112 LTE/HSPA+ Mobile Broadband Module (EMEA, APJ) *,**

Wireless LAN (WLAN)*

Atheros 802.11 b/g/n (1x1)***
Broadcom 802.11 a/b/g/n (2x2) with Bluetooth® v4.0 combo***
* WWAN is an optional feature sold separately or as an add on feature. WWAN 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, in all regions and only available on products featuring Intel processors.
***Wireless access point and Internet service is required and is not included. Availability of public wireless access points limited.
NOTE: Supports Bluetooth® v2.1 on Linux operating systems

Communications

Realtek 10/100/1000* Ethernet Controller
* 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.

Features

AUDIO/MULTIMEDIA

Audio

HD Audio with DTS Sound+
(2) Integrated stereo speakers
Integrated digital microphone (dual-microphone array when equipped with optional webcam)
Function keys for microphone mute, volume up, volume down
Stereo headphone/line out
Stereo microphone in

Webcam

Optional* 720p HD** webcam

- HD format (widescreen)
- Supports videoconferencing (non-HD) 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
- Skype-ready

* Sold separately as an optional feature.
** HD content required to view HD images.

KEYBOARDS/POINTING DEVICES/BUTTONS & FUNCTION KEYS

Keyboard

The HP spill-resistant keyboard is designed using a thin layer of Mylar film under the keyboard. The 101/102-key compatible keyboard features a full-pitch key layout with desktop keyboard features, such as editing keys, both left and right control and alt keys, and function keys. US and International key layouts are available. Includes a separate numeric keypad (HP ProBook 655 only).

Pointing Devices

Touchpad with gestures support, on/off button with LED indicator, two-way scroll, two pick buttons, optional point stick

Buttons and Function Keys

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

SOFTWARE AND SECURITY

Preinstalled Software with Windows Operating System

BIOS

HP DriveLock | HP Automatic Drive Lock
HP BIOS Protection*
HP Disk Sanitizer**
HP SpareKey***
Update via Network
Master Record Security
Power On Authentication
Pre-Boot Security
Secure Erase****

Features

Hybrid Boot
Measured Boot
Secure Boot
Absolute Persistence Module*****
* HP Tools partition with an HP BIOS required for automatic recovery.
** For the use cases outlined in the DOD 5220.22-M Supplement. Does not support Solid State Drives (SSDs). Initial setup required. Web history deleted only in Internet Explorer and Firefox browsers and must be user enabled.
*** Requires initial user set up.
**** For the methods outlined in the National Institute of Standards and Technology Special Publication 800-88.
***** The Absolute Persistence agent is shipped turned off, and is activated with customer purchase of a subscription. Service may be limited. Check with Absolute for availability outside the U.S. The optional subscription service of Absolute Recovery Guarantee is a limited warranty. Certain conditions apply. For full details visit: http://www.absolute.com/company/legal/agreements/computrace-agreement. If Data Delete is utilized, the Recovery Guarantee payment is null and void. In order to use the Data Delete service, customers must first sign a Pre-Authorization Agreement and either create a PIN or purchase one or more RSA SecurID tokens from Absolute Software.

MultiMedia
CyberLink PowerDVD
CyberLink Power2Go (Optical drives)
CyberLink YouCam BE (Windows 7 only)

Communication
HP Connection Manager (Windows 7 only)
HP GPS and Location*
HP Mobile Connect** (Windows 8 only)
HP Wireless Hotspot*** (Windows 8 only)
Intel WiDi Software****
HP Roaming Alert
Intel My WiFi and Wireless Drivers

HP Value Add Software
HP 3D DriveGuard
HP ePrint Driver***** (HP Exclusive)
HP PageLift (HP Exclusive)******
HP Recovery Manager (Windows 8 only)
HP Support Assistant W8
HP Recovery Disc Creator (Windows 7 only)
UEFI System Diagnostics W8

3rd Party
Adobe Flash Player (Commercial)
Skype*******
Buy Office
Free 50GB Cloud Storage & Collaboration Account********
Lync Optimized*********

*GPS access requires an unobstructed path to multiple satellites. Performance may be affected if/when used inside of buildings, bridges or heavily congested metropolitan areas. Requires separately purchased GPS navigation software available from multiple GPS applications.
**Internet access required.

Features

*** The wireless hotspot application requires an active internet connection and separately purchased data plan. While HP wireless hotspot is active, on-device applications will continue to work and will use the same data plan as the wireless hotspot. Wireless hotspot data usage may incur additional charges. Check with your service provider for plan details. Requires Windows.
**** Integrated Intel Wi-Di feature is available on select configurations only and requires separately purchased projector, tv or computer monitor with an integrated or external Wi-Di receiver. External Wi-Di receivers connect to the projector, tv or computer monitor via a standard HDMI cable, also sold separately.
*****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 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.
****** HP PageLift requires Windows 7 or higher edition.
******* Skype is not offered in China.
******** Offer available on new 2013 HP commercial PC and requires Box registration. Offer subject to change.
********* Lync software is sold separately. Requires internet access.

Security

Standard

HP Client Security*
HP Credential Manager
HP Password Manager
HP Drive Encryption (FIPS 140-2)**
HP Trust Circles Standard
HP Device Access Manager with Just In Time Authentication
TPM 1.2 Embedded Security Chip (Common Criteria EAL4+ Certified)
HP File Sanitizer***
HP Spare Key
Integrated Smart Card Reader (FIPS 201)
Security lock slot
Security screw for bottom access door
Microsoft Security Essentials (Windows 7)****
Microsoft Defender (Windows 8)
HP Fingerprint Sensor

* Not all features are remotely manageable.
** Requires Windows. Data is protected prior to Drive Encryption login. Turning the PC off or into hibernate logs out of Drive Encryption and prevents data access. Drive encryption planned to be available in October 2013.
*** For the use cases outlined in the DOD 5220.22-M Supplement. Does not support Solid State Drives (SSDs). Initial setup required. Web history deleted only in Internet Explorer and Firefox browsers and must be user enabled.
**** Opt in and internet connection required for updates.

For more information on HP security solutions refer to: http://www.hp.com/go/security.

Features

POWER

Power Supply

External 65W HP Smart AC Adapter
Power cord included is 1.8 m (+/- 0.1 m) or 1.0 m (+/- 0.1 m).
Total length including external AC adapter is TBD feet (TBD meter).
HP Fast Charge*

Primary Battery

HP 6-cell Lithium-Ion Battery (55 WHr)
HP 6-cell Long Life Lithium-Ion Battery (55 WHr)

Battery Life*

	Dual-Core	Quad-Core
HP ProBook 645		
6-cell (55 WHr) battery	Up to 9 hours 39 minutes	Up to 10 hours 25 minutes
6-cell Long Life (55 WHr) battery	TBD	Up to 10 hours 4 minutes
HP ProBook 655		
6-cell (55 WHr) battery	Up to 9 hours 27 minutes	Up to 9 hours 34 minutes
6-cell Long Life (55 WHr) battery	TBD	TBD

System Standby Time**

Up to TBD days

* Windows 7 battery life will vary depending on numerous factors including 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 www.bapco.com 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.

NOTE: Fast Charge recharges your battery up to 90% within 90 minutes when the system is off (6-cell only).

Power Conservation

AMD PowerPlay technology (discrete models)
Hibernation
Standby
ACPI compliance

Features

WEIGHTS & DIMENSIONS

HP ProBook 645 Notebook PC

Weight
Starting at 4.40 lb (2.0 kg) with weight saver (weight will vary by configuration)

Dimensions (w x d x h)
13.39 x 9.33 x 0.99 (front)/1.14 (rear) in
34.0 x 23.7 x 2.53 (front)/2.90 (rear) cm

HP ProBook 655 Notebook PC

Weight
Starting at 5.1 lb (2.32 kg) with weight saver (weight will vary by configuration)

Dimensions (w x d x h)
14.88 x 10.12 x 0.99 (front) -1.14 in (rear)
37.80 x 25.70 x 2.53 (front) -2.90 cm (rear)

PORTS/SLOTS

Ports
USB 3.0 – Three
USB 3.0 charging port– One
DisplayPort 1.2 – One
VGA – One
Stereo microphone input – One
Headphone/line out – One
RJ-45 (Ethernet) – One
Docking connector – One
Serial port – One*
Power connector – One
* ProBook 655 only

Expansion Slots
Media Card Reader
- supports SD, SDHC, SDXC

Features

SERVICE AND SUPPORT

HP Services offers limited 1-year warranty options depending on country;
1-year limited warranty on primary battery. On-site service and warranty upgrades are also available. Optional* HP Care Pack Services** are extended service contracts which go beyond your standard warranties. For more details visit: http://www.hp.com/go/lookuptool.

*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. Consult the HP Customer Support Center for details.
http://h20000.www2.hp.com/bizsupport/TechSupport/ProductRoot.jsp

NOTE: 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. For details, visit: **www.hp.com/go/cpc**

SYSTEM UNIT

Stand-Alone Power Requirements (AC Power)	**Nominal Operating Voltage**	TBD
	Average Operating Power	TBD W
	Max Operating Power	< 65 W
Temperature	**Operating**	32° to 95° F (0° to 35° C) (not writing optical) 41° to 95° F (5° to 35° C) (writing optical)
	Non-operating	-4° to 140° F (-20° to 60° C)
Relative Humidity	**Operating**	10% to 90%, non-condensing
	Non-operating	5% to 95%, 101.6° F (38.7° C) maximum wet bulb temperature
Shock	**Operating**	40 G, 2 ms, half-sine
	Non-operating	200 G, 2 ms, half-sine
Random Vibration	**Operating**	0.75 grms
	Non-operating	1.50 grms
Altitude (unpressurized)	**Operating**	-50 to 10,000 ft (-15.24 to 3,048 m)
	Non-operating	-50 to 40,000 ft (-15.24 to 12,192 m)
Planned Industry Standard Certifications	**UL**	Yes
	CSA	Yes
	FCC Compliance	Yes
	ENERGY STAR®	Select models*
	EPEAT	Registered TBD in United States**
	ICES	Yes
	Australia / NZ A-Tick Compliance	Yes
	CCC	Yes
	Japan VCCI Compliance	Yes
	KC	Yes
	BSMI	Yes
	CE Marking Compliance	Yes
	BNCI or BELUS	Yes
	CIT	Yes
	GOST	Yes
	Saudi Arabian Compliance (ICCP)	Yes
	SABS	Yes
	UKRSERTCOMPUTER	Yes

Technical Specifications

* Configurations of the HP ProBook 645 and HP ProBook 655 that are ENERGY STAR qualified are identified as HP ProBook 645 ENERGY STAR and HP ProBook 655 ENERGY STAR on HP websites and on www.energystar.gov.
** EPEAT registration varies by country. See www.epeat.net for registration status by country.
EPEAT status listed above applies to U.S.

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

DISPLAYS

14.0" diagonal LED-backlit HD anti-glare SVA eDP 1.2 flat (1366x768)	**Outline Dimensions** (W x H x D)	12.6 x 8.09 x 0.14 in (32.09 x 20.56 x 0.36 cm)	
	Active Area	12.18 x 6.85 in (30.94 x 17.395 cm)	
	Weight	0.71 lb (320g) (max)	
	Diagonal Size	14.0 in (35.6cm)	
	Surface Treatment	Anti-glare	
	Contrast Ratio	300:1 (min)	
	Refresh Rate	60 Hz	
	Brightness	200 nit (typical)	
	Pixel Resolution	**Format**	1366 x 768 (HD)
		Configuration	RGB Stripe
	Interface	eDP 1.2 (1 lane)	
	LCD Mode	TN	
	PPI	125 ppi	
	Viewing Angle	SVA 40/40/15/30 (Left/Right/Down/Up)	
14.0" diagonal LED-backlit HD+ anti-glare SVA eDP 1.2 flat (1600 x 900)	**Outline Dimensions** (W x H x D)	12.6 x 8.09 x 0.14 in (32.09 x 20.56 x 0.36 cm)	
	Active Area	12.19 x 6.86 in (30.96 x 17.415 cm)	
	Weight	0.72 lb (325 g) (max)	
	Diagonal Size	14.0 in (35.6cm)	
	Surface Treatment	Anti-glare	
	Contrast Ratio	300:1 (min)	
	Refresh Rate	60 Hz	
	Brightness	250 nit (typical)	
	Pixel Resolution	**Format**	1600 x 900 (HD+)
		Configuration	RGB Stripe
	Interface	eDP 1.2 (1 lane)	
	LCD Mode	TN	
	PPI	131 ppi	
	Viewing Angle	SVA 40/40/15/30 (Left/Right/Down/Up)	

15.6" diagonal LED-backlit HD anti-glare SVA eDP 1.2 flat (1366x768)	**Outline Dimensions** (W x H x D)	14.17 x 8.83 x 0.15 in (36.0 x 22.43 x 0.38 cm)	
	Active Area	13.55 x 7.62 in (34.42 x 19.35 cm)	
	Weight	< 1.1 lb (500 g) (max)	
	Diagonal Size	15.6 in (39.62 cm)	
	Surface Treatment	Anti-glare	
	Contrast Ratio	300:1 (min)	
	Refresh Rate	60 Hz	
	Brightness	200 nit (typical)	
	Pixel Resolution	**Format**	1366 x 768 (HD)
		Configuration	RGB Stripe
	Interface	eDP 1.2 (1 lane)	
	LCD Mode	TN	
	PPI	101 ppi	
	Viewing Angle	SVA 40/40/15/30 (Left/Right/Down/Up)	

15.6" diagonal LED-backlit FHD anti-glare SVA eDP 1.2 slim (1920x1080)	**Outline Dimensions** (W x H x D)	TBD	
	Active Area	TBD	
	Weight	TBD	
	Diagonal Size	TBD	
	Surface Treatment	TBD	
	Contrast Ratio	TBD	
	Refresh Rate	TBD	
	Brightness	TBD	
	Pixel Resolution	**Format**	1920 x 1080 (FHD)
		Configuration	RGB Stripe
	Interface	eDP 1.2 (2 lane)	
	LCD Mode	TN	
	PPI	TBD	
	Viewing Angle	UWVA 85/85/85/85 (Left/Right/Down/Up)	

STORAGE AND DRIVES

Internal Storage

Technical Specifications

320 GB* 7200 rpm SATA Hard Drive	**Drive Weight**	0.25 lbs (115 g)	
	Capacity	320 GB	
	Height	0.37 in (9.5 mm)	
	Width	2.75 in (70 mm)	
	Interface	ATA-8, SATA 2.6, 3.0 Gb/s, NCQ	
	Transfer Rate	**Synchronous** (maximum)	300 MB/s (Drive Capability)
	Seek Time (typical reads, including settling)	**Single Track**	1.5 ms
		Average	11 ms
		Maximum	22 ms
	Cache	16 MB	
	Rotational Speed	7200 rpm	
	Logical Blocks	625,142,448	
	Operating Temperature	32° to 140° F (0° to 60° C) [case temp]	
	Features	ATA Security	
500 GB* 7200 rpm SATA Hard Drive	**Drive Weight**	0.25 lbs (115g)	
	Capacity	500 GB	
	Height	0.37 in (9.5 mm)	
	Width	2.75 in (70 mm)	
	Interface	ATA-8, SATA 2.6, 3.0 Gb/s, NCQ	
	Transfer Rate	**Synchronous** (maximum)	300 MB/s (Drive Capability)
	Seek Time (typical reads, including settling)	**Single Track**	1.5 ms
		Average	11 ms
		Maximum	22 ms
	Rotational Speed	7200 rpm	
	Logical Blocks	976,773,168	
	Operating Temperature	32° to 140° F (0° to 60° C) [case temp]	
	Features	ATA Security	

Technical Specifications

SATA 6 Gb/s 128 GB*, 2.5-inch Solid State Drive	**Drive Weight**	73 Grams	
	Capacity	128 GB	
	Height	0.276 in (7 mm)	
	Width	2.76 in (70 mm)	
	Interface	SATA 3 (6 Gb/s)	
	Performance	**Maximum Sequential Read**	**Maximum Sequential Write**
		415 MB/s	175 MB/s
	Logical Blocks	250,069,680	
	Operating Temperature	32° to 158°F (0° to 70°C) [case temp]	
	Features	ATA Security; ATA-8; SATA 3.0; DIPM; TRIM	
SATA 6 Gb/s 180 GB*, 2.5-inch SATA Solid State Drive	**Drive Weight**	78 Grams	
	Capacity	180 GB	
	Height	0.276 in (7 mm)	
	Width	2.76 in (70 mm)	
	Interface	SATA Gen 3 (6 Gb/s)	
	Performance	**Maximum Sequential Read**	**Maximum Sequential Write**
		Up to 550 MB/s	Up to 520 MB/s
	Logical Blocks	351,651,888	
	Operating Temperature	32° to 158°F (0° to 70°C) [case temp]	
	Features	ATA Security; ATA-8, SATA 3.0; DIPM; TRIM	
SATA 6 Gb/s 256 GB*, 2.5-inch SATA SED Solid State Drive	**Drive Weight**	73 Grams	
	Capacity	256 GB	
	Height	0.276 in (7 mm)	
	Width	2.76 in (70 mm)	
	Interface	SATA 3 (6 Gb/s)	
	Performance	**Maximum Sequential Read**	**Maximum Sequential Write**
		Up to 460 MB/s	Up to 260 MB/s
	Logical Blocks	500,118,192	
	Operating Temperature	32° to 158°F (0° to 70°C) [case temp]	
	Features	ATA Security; ATA-8 compliant; SATA 3.0; DIPM; TRIM	

* For hard drives and solid state drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 16 GB (for Windows 7) and 36 GB (for Windows 8) of system disk is reserved for the system recovery software.
** * FIPS-certified, hardware-based AES-256 encryption image.

OPTICAL DRIVES

Technical Specifications

DVD+/-RW SuperMulti DL Drive	**Access Times**	Random	<140ms CD (typical) < 160 ms DVD (typical)
	Max Data Transfer Rate	24X CD-ROM 8X DVD 24X CD-R 24X CD-RW 8X DVD+R 8X DVD+RW 8X DVD-R 6X DVD-RW 6X - DVD+R Dual Layer 6X - DVD-R Dual Layer 5X DVD-RAM	
	Transfer Mode	UDMA Mode 5	
	Interface	Gen 1 SATA	
	Supported Media (read)	CD-DA, CD-TEXT, CD-ROM, CD-ROM XA, MIXED MODE CD, CD-I, CD-I Bridge (Photo-CD, Video CD), Multisession CD (Photo-CD, CD-EXTRA, Portfolio, CD-R, CD-RW), CD-R, CD-RW, DVD-ROM (DVD-5, DVD-9, DVD-10, DVD-18), DVD-R, DVD-RW, DVD+R, DVD+RW, DVD-RAM	
	Supported Media (write)	CD-R, CD-RW, DVD+R, DVD+RW, DVD-R, DVD-RW, DVD-RAM, DVD+R DL, DVD-R DL	
	Max Media Capacity (read)	8.5 GB	
	Max Media Capacity (write)	8.5 GB	
	Transport	Tray Loading	
DVD-ROM Drive	**Access Times**	Random	< 140 ms CD (typical) < 160 ms DVD (typical)
	Max Data Transfer Rate	24X CD-ROM 8X-DVD	
	Transfer Mode	UDMA Mode 5	
	Interface	Gen 1 SATA	
	Supported Media (read)	CD-DA, CD-TEXT, CD-ROM, CD-ROM XA, MIXED MODE CD, CD-I, CD-I Bridge (Photo-CD, Video CD), Multisession CD (Photo-CD, CD-EXTRA, Portfolio, CD-R, CD-RW), CD-R, CD-RW, DVD-ROM (DVD-5, DVD-9, DVD-10, DVD-18), DVD-R, DVD-RW, DVD+R, DVD+RW, DVD-RAM	
	Supported Media (write)	None	
	Max Media Capacity (read)	8.5GB	
	Transport	Tray Loading	

SECURITY

Technical Specifications

HP Fingerprint Reader	**Mobile Voltage Operation**	3.0V-3.6V
	Operating Temperature	14° - 167°F (-10° - 75°C)
	Current Consumption Image	36 mA peak
	Low Latency Wait for Finger	950 uA
	Capture Rate	3000. lines/sec
	ESD Resistance	IEC 61000-4-2 4B (±15KV)
	Detection Matrix	200*1 (plus another secondary line) 508 dpi 12*3 mm sensor area

NETWORKING/COMMUNICATIONS

Integrated Realtek 10/100/1000 NIC	**Ethernet Features**	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 Situation-sensitive features reduce power consumption Advanced link down power saving for reducing link down power consumption
	Performance Features	TCP/IP/UDP Checksum Offload (configurable) Protocol Offload (ARP & NS) Large send offload and Giant send offload Receiving Side Scaling
	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
	NIC Device Driver Name	Realtek PCIe GBE Ethernet Family Controller
HP hs3110 HSPA+ Mobile Broadband Module*	**Technology/Operating Bands**	CDMA/1xRTT/EvDO: 800MHz (Cell), 1900MHz (PCS) GSM/GPRS/EDGE: 850MHz (Cell), 900MHz (EGSM), 1800MHz (DCS), 1900MHz

Technical Specifications

	(PCS) UMTS/WCDMA with receive diversity: 2100MHz (UTRA FDD Band I), 1900MHz (UTRA FDD Band II), 900MHz (UTRA FDD Band VIII), 850 MHz (UTRA FDD Band V) LTE: 700 MHz (Verizon, Band XIII)
Mobile Operator	Verizon (US only)
Wireless Protocol Standards	GSM/GPRS/EDGE: Class B, Multi-slot class 10 operation, coding schemes CS1 - CS4 and MSC1 - MSC9. CDMA: 1xEVDO Release 0 and Release A, IS-95A, IS-95B, IS-856, IS-2000 UMTS/WCDMA: Release 99 and Release 7 LTE: Power Class III as per 3GPP TS 36.101
Wireless Parametric Standards	Complies with 3GPP specifications Release 8 for LTE
Maximum Data Rates	EvDO (Revision A) - 3.1 Mbps (Download), 1.8 Mbps (Upload) WCDMA (DC-HSPA+) - 42Mbps (Download) LTE (Category 3) - 100 Mbps (Download), 50Mbps (Upload)
GPS	Standalone, Assisted, XTRA
GPS Bands	1575.42 MHz (± 1.023 MHz)
Maximum Output Power	GSM/GPRS/EDGE: 32dBm (+/-1) WCDMA: 24dBm (+0.7/-2.3) LTE: +23 dBm (+2.7 dBm/-1.7 dBm) 1xRTT/EvDO: +24 dBm (+0.5 dBm/-1.5 dBm)
Maximum Power Consumption	2700mA (peak)
Power Consumption, Sleep Mode	10 mA
Power Management	USB selective suspend Integrated notebook wireless button
Antenna Type	Dual high efficiency 6 band antennae with spatial diversity, mounted in the display enclosure
Form Factor	PCI-Express MiniCard, USB 2.0 interface
Weight	< 10 g
Dimensions (Length x Width x Thickness)	2.01 x 1.18 x 0.18 in (51 x 30 x 5 mm)
Voltage, Operating	3.3v +/- 9%
Temperature, Operating (from TIA/EIA/IS-98-D)	-4° to 149° F (-20° to 65° C)
Temperature, Non-operating, 96 hours (from MIL-STD 202 Method 108)	-40° to 185° F (-40° to 85° C)
Humidity, Non-operating	85% relative humidity for 48 hours @ 185° F (85° C) (non-condensing)
LED Activity	LED Off - Radio Off; Solid LED On - Radio On

* Mobile Broadband is an optional feature sold separately or as an add on 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 lt4112 LTE/HSPA+ Gobi 4G Module*	**Technology/Operating Bands**	LTE FDD all bands with diversity: 2100 MHz (Band I), 1900 MHz (Band II), 1800 MHz (Band III), 850 MHz (Band V), 2600 MHz (Band VII), 900 MHz (Band VIII), 800 MHz (Band XX, DD800) WCDMA/HSDPA/HSUPA/HSPA+ all bands with diversity: 2100 MHz (Band I), 1900 MHz (Band II), 800 MHz (Band V), 900 MHz (Band VIII) GSM/GPRS/EDGE: 1900 MHz (Band II), 1800 MHz (Band III), 850 MHz (Band V), 900 MHz (Band VIII)
	Wireless Protocol Standards	3GPP Release 8 LTE Specification WCDMA R99, 3GPP Release 5, 6 and 7 UMTS Specification
	Wireless Parametric Standards	Complies with 3GPP specifications Release 8 for LTE
	Maximum Data Rates	LTE (Category 3): 100 Mbps (Download), 50Mbps (Upload) DC-HSPA+: 42 Mbps (Download), 5.76 Mbps (Upload) HSPA+: 21.6 Mbps (Download), 5.76 Mbps (Upload) EDGE: 236.8 kbps (Download), 236.8 kbps (Upload) GPRS: 85.6 kbps(Download), 85.6 kbps (Upload)
	GPS	Standalone
	GPS Bands	1575.42 MHz (± 1.023 MHz), GLONASS 1596-1607MHz
	Maximum Output Power	LTE: +23 dBm (+/- 2 dBm) WCDMA: +23.5 dBm (+/- 1 dBm) GPRS Band II, III: +29.5 dBm (+/- 1 dBm) GPRS Band V, VIII: +32.5 dBm (+/- 1 dBm) EGPRS Band II, III: +26.5 dBM (+/-1.5 dBm) EGPRS Band V, VIII: +27.5 dBM (+/-1.5 dBm)
	Maximum Power Consumption	LTE: 1,200 mA (peak); <900 mA (average) WCDMA: 1,100 mA (peak); <800 mA (average) EGPRS: 2,800 mA (peak); <700 mA (average)
	Power Consumption, Sleep Mode	3 mA
	Power Management	USB selective suspend, Integrated notebook wireless button
	Antenna Type	Dual high efficiency multi-band antennae with spatial diversity
	Form Factor	M.2, USB 2.0 interface
	Weight	6 g
	Dimensions (Length x Width x Thickness)	42 mm × 30 mm × 2.3 mm
	Voltage, Operating	3.135 V to 4.4 V (3.3 V +1.1V/-0.165V)
	Temperature, operating (from TIA/EIA/IS-98-D)	14° to 131° F (-10° to 55° C)

	Temperature, non-operating, 96 hours (from MIL-STD 202 Method 108)	-40° to 185° F (-40° to 85° C)
	Humidity, Non-operating	95% relative humidity for 48 hours @ 185° F (85° C) (non-condensing)
	LED Activity	LED Off - Radio Off; Solid LED On - Radio On

* 4G LTE not available on all products, in all regions and only available on products featuring Intel processors. 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.

Atheros 802.11 b/g/n (1x1)*	**Wireless LAN Standards**	IEEE 802.11b IEEE 802.11g IEEE 802.11n
	Interoperability	Wi-Fi certified
	Frequency Band	2.4 GHz
	Data Rates	802.11b: 1, 2, 5.5, 11 Mbps 802.11g: 6, 9, 12, 18, 24, 36, 48, 54 Mbps 802.11n: many possible data rates, ranging from 6 Mbps to 300 Mbps, depending on the combination of Bandwidth, Modulation Coding Scheme, and Guard Interval used, as defined in IEEE 802.11n specification
	Modulation	Direct Sequence Spread Spectrum DBPSK, DQPSK, CCK, OFDM, BPSK, QPSK, 16-QAM, 64-QAM
	Security[1]	Supports 64- and 128-bit WEP, WPA, WPA2, hardware-accelerated AES, 802.1x authentication types EAP-TLS, EAP-TTLS, PEAP-GTC, PEAP-MSCHAPv2, LEAP, EAP-FAST.
	Sub-channels	Multinational support with frequency bands and channels compliant to local regulations.
	Media Access Protocol	CSMA/CA (Collision Avoidance) with ACK
	Network Architecture Models	Ad-hoc (Peer to Peer) Infrastructure (Access Point Required)
	Roaming	IEEE 802.11 compliant roaming between access points
	Output Power[2]	13.5 dBm, nominal
	Power Consumption	Transmit: 2.0 W (max) Receive: 1.6 W (max) Associated to Access Point, Idle: 250 mW nominal Wireless Button Off: 100 mW nominal Radio disabled: 75 mW nominal
	Power Management	ACPI compliant power management 802.11 compliant power saving mode
	Receiver Sensitivity[3]	72.2 Mbps: -70 dbm, 54 Mbps: -74 dBm, 11 Mbps: -88 dBm , 1 Mbps: -95 dBm
	Antenna Connections	High efficiency antenna with spatial diversity, mounted in the display enclosure
	Form Factor	PCI-Express Half-MiniCard 1.2
	Weight	0.013 lb (6 g)

Technical Specifications

Dimensions	0.19 x 1.06 x 1.18 in (4.75 x 26.8 x 30 mm)	
Operating Voltage	3.3v +/- 9%	
Temperature	Operating Non-operating	14° to 158° F (-10° to 70° C) -40° to 176° F (-40° to 80° C)
Humidity	Operating Non-operating	10% to 90% (non-condensing) 5% to 95% (non-condensing)
Altitude	Operating Non-operating	0 to 10,000 ft (3,048 m) 0 to 50,000 ft (15,240 m)
LED Activity	LED Off - Radio OFF; Solid LED On - Radio ON	

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

Broadcom 802.11 a/b/g/n (2x2) with Bluetooth® v4.0 combo*	**Wireless LAN Standards**	IEEE 802.11a IEEE 802.11b IEEE 802.11g IEEE 802.11n
	Interoperability	Wi-Fi certified
	Frequency Band	802.11b/g/n • 2.402 - 2.482 GHz 802.11a/n • 4.9 - 4.95 GHz (Japan) • 5.15 - 5.25 GHz • 5.25 - 5.35 GHz • 5.47 - 5.725 GHz • 5.825 - 5.850 GHz • 2.402 - 2.482 GHz
	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.
	Modulation	Direct Sequence Spread Spectrum BPSK, QPSK, CCK, 16-QAM, 64-QAM
	Security[1]	• IEEE and WiFi compliant 64 / 128 bit WEP encryption for a/b/g mode only • AES-CCMP: 128 bit in hardware • 802.1x authentication • WPA, WPA2: 802.1x. WPA-PSK, WPA2-PSK, TKIP, and AES. • WPA2 certification • IEEE 802.11i • Cisco Certified Extensions, all versions through V5 • WAPI

Technical Specifications

Network Architecture	Ad-hoc (Peer to Peer)
Models	Infrastructure (Access Point Required)
Roaming	IEEE 802.11 compliant roaming between access points
Output Power[2]	• 2.4G: +13.5dBm minimum • 5G: +12dBm minimum • Maximum output power must be able to achieve modular regulatory certification with notebooks that have antennas >20cm from the user and peak gain of +3dBi at 2.4GHz and +4dBi at 5GHz
Power Consumption	Transmit: 2.0 W (max) Receive: 1.6 W (max) Idle mode (PSP): 250 mW (WLAN Associated) Idle mode: 100 mW (WLAN unassociated) Radio disabled: 75 mW
Power Management	ACPI and PCI Express compliant power management 802.11 compliant power saving mode
Receiver Sensitivity[3]	802.11b:-95 dBm (1 Mbps), -93 dBm (2 Mbps), -91 dBm (5.5 Mbps), -88 dBm (11 Mbps) 802.11a/g:-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 (72.2 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	0.19 x 1.06 x 1.18 in (4.75 x 26.8 x 30 mm)
Weight	3.3g
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 Off - Radio OFF; Solid LED On - 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).

Bluetooth Specification

V4.0 High Speed, V2.1+EDR, backwards compatible with V1.1, 1.2 and 2.0

Number of Available Channels	79 (1 MHz) available channels

Technical Specifications

Data Rates and Throughput	3 Mbps data rate; throughput up to 2.17 Mbps Synchronous Connection Oriented links up to 3, 64 kbps, voice channels Asynchronous Connection Less links 2178.1 kbps/177.1 kbps asymmetric or 1306.9 kbps symmetric
Transmit Power	-6 dBm to 4 dBm (Bluetooth Class II)
Receiver Sensitivity	Better than -80 dBM at 0.1 % raw bit error rate
Power Consumption	Peak (Tx) 330 mW Peak (Rx) 230 mW Sleep <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	Generic Access Profile (GAP) Service Discovery Application Profile (SDAP) Serial Port Profile (SPP) Dial_Up Networking Profile (DUN) Generic Object Exchange Profile (GOEP) Object Push Profile (OPP) File Transfer Profile (FTP) Synchronization Profile (SYNC) Hard Copy Cable Replacement (HCRP) Personal Area Networking Profile (PAN) Human Interface Device Profile (HID) Generic Audio/Video Distribution Profile (GAVDP) Advanced Audio/Video Distribution Profile (A2DP) FAX Profile (FAX) Basic Imaging Profile (BIP) Headset Profile (HSP) Hands Free Profile (HFP) Basic Printing Profile (BPP) VDP (Video Distribution Profile) AVRCP (Audio Video Remote Control Profile)

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

AUDIO/MULTIMEDIA - DTS SOUND+

Hardware	**Implementation**	IDT 92HD91
	Function Key Volume Controls	Volume up, volume down, and mute
	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	>85 dB
	Total Harmonic Distortion	0.01%
	Noise Floor	-110 dB
	Play/Record Sampling Rate(s)	8 kHz - 48kHz
	DAC	16, 20 or 24-bit
	ADC	16 or 20-bit
Integrated Stereo Speakers	**Power Rating**	2 Watts
	Impedance	4 Ohms

POWER

Technical Specifications

HP 65W Smart AC Adapter	**Dimensions**	4.17 x 1.85 x 1.1 in (10.6 x 4.7 x 2.8 cm)	
	Weight	0.62 lb (280 g)	
	Input	100 to 240 VAC	
		Input Efficiency	87% min at 115 VAC
		Input frequency range	47 to 63 Hz
		Input AC current	1.7 A at 90 VAC, 0.85 A at 180 VAC
	Output	**Output power**	65W
		DC output	18.5V
		Hold-up time	5 msec at 115 VAC input
		Output current limit	<11A, Over voltage protection- 29V max automatic shutdown
	Connector	3 pin/grounded, mates with interchangeable cords	
	Environmental Design	**Operating temperature**	32° to 104° F (0° to 40° C)
		Non-operating (storage) temperature	-4° to 149° F (-20° to 65° C)
		Altitude	0 to 10,000 ft (0 to 3,048 m)
		Humidity	20% to 80%
		Storage Humidity	10% to 90%
	EMI and Safety Certifications	CE Mark - full compliance with LVD and EMC directives; Worldwide safety standards - 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 6-cell (55 WHr) Lithium-Ion Primary battery	**Dimensions** (H x W x L)	0.8 x 1.8 x 8.0in (2.0 x 4.7 x 20.5cm)	
	Weight (max)	.70lb, (.313kg)	
	Cells/Type	Lithium-Ion	
	Energy	**Voltage**	10.8V
		Amp-hour capacity	5.1Ah
		Watt-hour capacity	55Wh
	Temperature	**Operating (Charging)**	32° to 113° F (0° to 45° C)
		Operating (Discharging)	14° to 122° F(-10° to 50° C)
		Non-operating	-4° to 122° F (-20° to 50° C)
	Battery Re-Charge Time	**System in OFF or Standby Mode**	2.5 hours
		System ON	3 to 5 hours
	Fuel Gauge LED	No	
	Warranty	1 year	
	Compatible with optional Travel Battery	Yes	

Technical Specifications

HP 6-cell (55 WHr) Long Life Primary Battery	**Dimensions** (H x W x L)	0.8 x 1.8 x 8.0in (2.0 x 4.7 x 20.5cm)	
	Weight (max)	.72lb, (.323kg)	
	Cells/Type	Lithium-Ion	
	Energy	**Voltage**	10.8V
		Amp-hour capacity	5.1Ah
		Watt-hour capacity	55Wh
	Temperature	**Operating (Charging)**	32° to 113° F (0° to 45° C)
		Operating (Discharging)	14° to 122° F(-10° to 50° C)
		Non-operating	-4° to 122° F (-20° to 50° C)
	Battery Re-Charge Time	**System in OFF or Standby Mode**	2.5 hours
		System ON	3 to 5 hours
	Fuel Gauge LED	No	
	Warranty	3 years*	
	Compatible with optional Travel Battery	Yes	

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

HP 3-cell (33 WHr) Lithium-Ion Primary battery	**Dimensions** (H x W x L)	TBD in (TBD cm)	
	Weight (max)	TBD lb, TBD kg)	
	Cells/Type	Lithium-Ion	
	Energy	**Voltage**	11.1V
		Amp-hour capacity	2.95Ah
		Watt-hour capacity	33Wh
	Temperature	**Operating (Charging)**	32° to 113° F (0° to 45° C)
		Operating (Discharging)	14° to 140° F(-10° to 60° C)
		Non-operating	-4° to 140° F (-20° to 60° C)
	Battery Re-Charge Time	**System in OFF or Standby Mode**	TBD hours
		System ON	TBD hours
	Fuel Gauge LED	No	
	Warranty	1 year	

ENVIRONMENTAL

Technical Specifications

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.

HP ProBook 645 G1 Notebook PC

System Configuration

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

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

	115VAC, 60Hz	230VAC, 50Hz	100VAC, 60Hz
Normal Operation	8.38 W	8.61 W	8.45 W
Sleep	1.28 W	1.33 W	1.28 W
Off	0.46 W	0.49 W	0.46 W

NOTE:

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

Heat Dissipation*

	115VAC, 60Hz	230VAC, 50Hz	100VAC, 60Hz
Normal Operation	29 BTU/hr	29 BTU/hr	29 BTU/hr
Sleep	4 BTU/hr	5 BTU/hr	4 BTU/hr
Off	2 BTU/hr	2 BTU/hr	2 BTU/hr

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

Technical Specifications

Declared Noise Emissions (in accordance with ISO 7779 and ISO 9296)	Sound Power (LWAd, bels)	Sound Pressure (LpAm, decibels)
Typically Configured - Idle	3.37	27
Fixed Disk - Random writes	3.42	27

Batteries

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

Batteries used in the product do not contain:
Mercury greater the1ppm by weight
Cadmium greater than 20ppm by weight

Battery 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 0.0 % post-consumer recycled plastic (by wt.)
- This product is 95.4% recycle-able when properly disposed of at end of life.

Packaging Materials

- External:
  - PAPER/Corrugated 482.6 g
- Internal:
  - PLASTIC/EPE (Expanded Polyethylene) 28 g
  - PLASTIC/Polyethylene low density 30.4 g
- The PAPER/Corrugated contains at least 70% recycled content.
- The PLASTIC/EPE (Expanded Polyethylene) materials contains at least 50 % recycled content.
- The PLASTIC/Polyethylene low density) materials contains at least 50 % recycled content.

HP ProBook 655 G1 Notebook PC

System Configuration

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

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

	115VAC, 60Hz	230VAC, 50Hz	100VAC, 60Hz
Normal Operation	8.5 W	8.81 W	8.55 W
Sleep	1.4 W	1.45 W	1.42 W
Off	0.47 W	0.49 W	0.46 W

NOTE:

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

Heat Dissipation*

	115VAC, 60Hz	230VAC, 50Hz	100VAC, 60Hz
Normal Operation	29 BTU/hr	30 BTU/hr	29 BTU/hr
Sleep	5 BTU/hr	5 BTU/hr	5 BTU/hr
Off	2 BTU/hr	2 BTU/hr	2 BTU/hr

* 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 (LWAd, bels)	Sound Pressure (LpAm, decibels)
Typically Configured - Idle	3.37	27
Fixed Disk - Random writes	3.42	27

Batteries

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

Batteries used in the product do not contain:
Mercury greater the1ppm by weight
Cadmium greater than 20ppm by weight

Battery 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 0.0 % post-consumer recycled plastic (by wt.)

- This product is 97.5 % recycle-able when properly disposed of at end of life.

Packaging Materials

- External:
  - PAPER/Corrugated 513.5 g
- Internal:
  - PLASTIC/EPE (Expanded Polyethylene) 33.4 g
  - PLASTIC/Polyethylene low density 26 g
- The PAPER/Corrugated contains at least 70% recycled content.
- The PLASTIC/EPE (Expanded Polyethylene) materials contains at least 50 % recycled content.
- The PLASTIC/Polyethylene low density) materials contains at least 50 % recycled content.

ALL MODELS

MATERIAL USAGE

This product does not contain any of the following substances in excess of regulatory limits (refer to the HP General Specification for the Environment at: http://www.hp.com/hpinfo/globalcitizenship/environment/pdf/gse.pdf):

- Asbestos
- Certain Azo Colorants
- Certain Brominated Flame Retardants - may not be used as flame retardants in plastics
- Cadmium
- Chlorinated Hydrocarbons
- Chlorinated Paraffins
- Formaldehyde
- Halogenated Diphenyl Methanes
- Lead carbonates and sulfates
- Lead and Lead compounds
- Mercuric Oxide Batteries
- Nickel - finishes must not be used on the external surface designed to be frequently handled or carried by the user.
- Ozone Depleting Substances
- Polybrominated Biphenyls (PBBs)
- Polybrominated Biphenyl Ethers (PBBEs)
- 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

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.

HEWLETT-PACKARD CORPORATE ENVIRONMENTAL INFORMATION

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

Global Citizenship Report
http://www.hp.com/hpinfo/globalcitizenship/gcreport/index.html
Eco-label certifications
http://www8.hp.com/us/en/hp-information/environment/ecolabels.html
ISO 14001 certificates:
http://www.hp.com/hpinfo/globalcitizenship/environment/pdf/PC_GBU_Product_Design_ISO_14K_Certificate.pdf
and
http://www.hp.com/hpinfo/globalcitizenship/environment/pdf/cert.pdf

Country of Origin

TBD

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

Type	Description	Part #
Cases	HP Professional Series Carrying Case (up to 15.6")	H4J90AA
	HP Professional Slim Top Load Case (up to 17.3")	H4J91AA
	HP Business Backpack (up to 17.3")	H5M90AA
	HP Business 4 Wheel Roller Case	H5M93AA
Docking	HP Adjustable Dual Monitor Stand	AW664AA#xxx
	HP Adjustable Display Stand	AW663AA#xxx
	HP Display and Notebook Stand	AW662AA#xxx
	HP LCD Monitor Stand	QM196AA
	HP 90W Docking Station	A7E32AA#xxx
	HP 120W Advd Docking Station	A7E36AA#xxx
Input/Output	HP Ultra Mobile Wireless Mouse	H6F25AA
	HP Stylish Wireless KB/Mouse	H4B79AA
	HP Stylish USB KB/Mouse	H4B80AA
Adapters	HP 65W Slim Adapter	AX727AA#XXX
	90W Smart AC Adapter	ED495AA#xxx
	90W Slim Adapter	BT796AA#xxx
	HP 65W Smart AC Adapter	H6Y89AA
	HP 90W Smart AC Adapter	H6Y90AA
	HP 65W Slim AC Adapter	H6Y82AA
	HP 90W Slim AC Adapter	H6Y83AA
Batteries	HP ST09 Extended Life Notebook Battery	QK639AA
	HP BB09 Ultra Extended Life Notebook Battery	QK640AA
Security	HP Docking Station Cable Lock	AU656AA#XXX
	HP UltraSlim Keyed Cable Lock	H4D73AA
Storage - External Storage	HP Mobile USB DVDRW	A2U57AA
Health and Education	HP 20-Notebook Managed Charging Cart	QL489AA#xxx
	HP 30-Notebook Managed Charging Cart	QL490AA

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

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