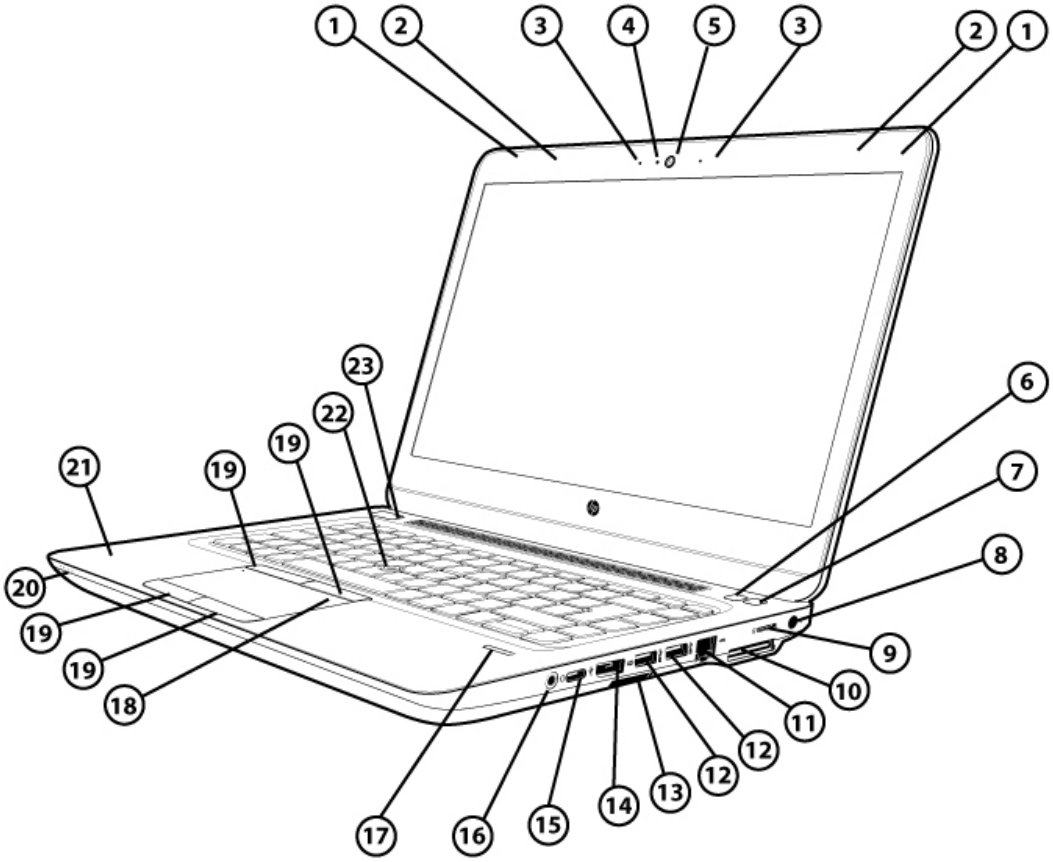
Overview

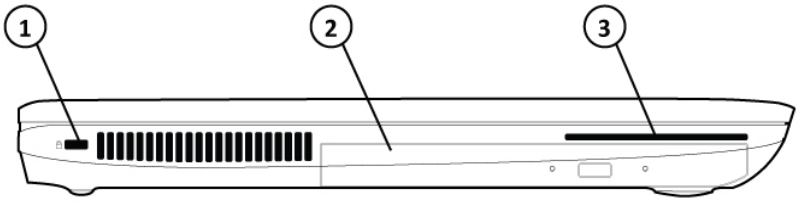
HP ProBook 640 G2 Notebook PC



Front/Right

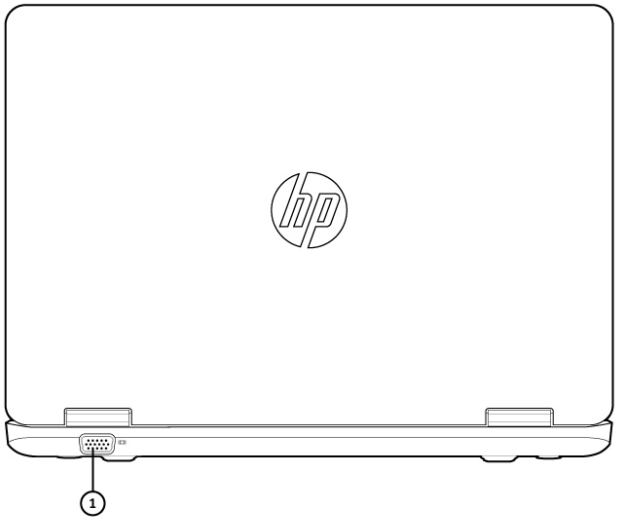
1. WLAN antennas (2)
2. WWAN antennas (2) (select models)
3. Internal microphones (2)
4. Webcam LED (select models)
5. Webcam (select models)
6. Wireless on/off button
7. Speaker mute button
8. Power connector
9. SIM card slot
10. Docking connector
11. Ethernet port
12. USB 3.0 ports (2)
13. SD card slot
14. Display port
15. USB-C™ port
16. Microphone/ headphones combo jack
17. Fingerprint reader (select models)
18. Touchpad
19. Touchpad buttons (4)
20. Indicator LEDs: Wireless Light, Power Light, AC Adapter/Battery Light, Storage Usage Light
21. NFC (select models)
22. Pointstick
23. Power button

Overview



Left

1. Security lock slot
2. Optical drive
3. Smart Card Reader

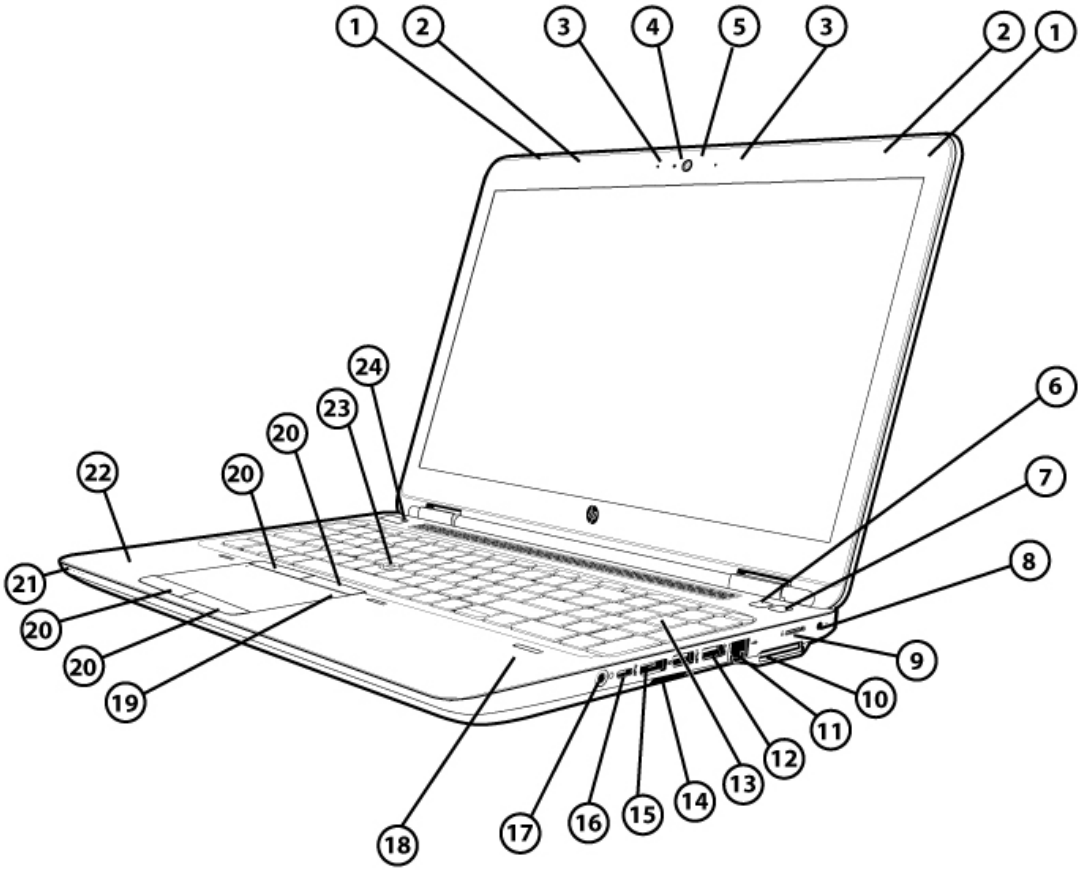


Back

1. VGA port

Overview

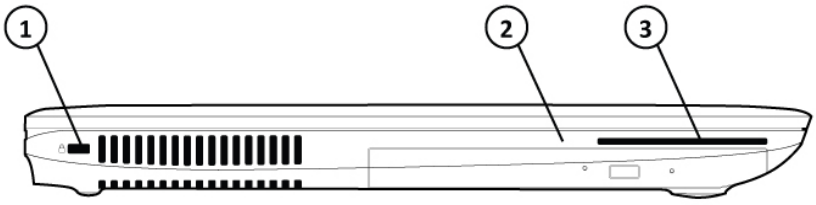
HP ProBook 650 G2 Notebook PC



Front/Right

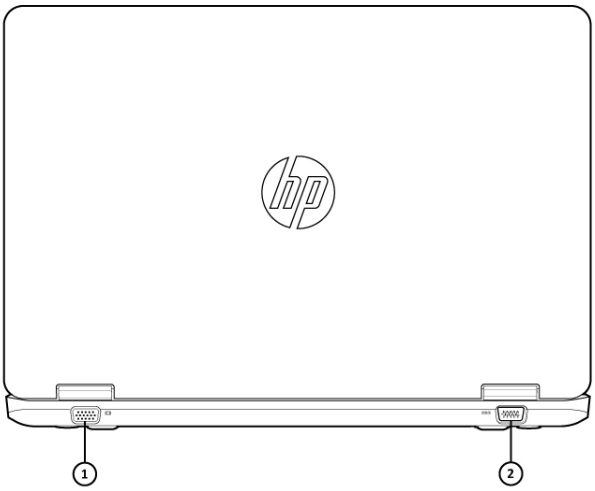
1. WLAN antennas (2)
2. WWAN antennas (2) (select models)
3. Internal microphones (2)
4. Webcam LED (select models)
5. Webcam (select models)
6. Wireless on/off button
7. Speaker mute button
8. Power connector
9. SIM card slot
10. Docking connector
11. Ethernet port
12. USB 3.0 ports (2)
13. Numeric keypad
14. SD card slot
15. Display port
16. USB-C™ port
17. Microphone/ headphones combo jack
18. Fingerprint reader (select models)
19. Touchpad
20. Touchpad buttons (4)
21. Indicator LEDs: Wireless Light, Power Light, AC Adapter/Battery Light, Storage Usage Light
22. NFC (select models)
23. Pointstick
24. Power button

Overview



Left

1. Security lock slot
2. Optical drive
3. Smart card reader



Back

1. VGA port
2. Serial port optional (650 only)

Overview

AT A GLANCE

- Windows 10 versions, Windows 8.1 versions, Windows 7 versions, NeoKylin Linux 64, FreeDOS 2.0
- Choice of 6th Generation Intel® Core™ processors
- Thin and light design– PC-ABS (Polycarbonate–Acrylnitrile/Butadiene/Styrene) durable material is nearly 20% thinner; 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 (compared to previous generation)
- The HP Premium keyboard is spill-resistant and offered with optional backlit design
- Large Touchpad with gestures support, on/off button with LED indicator
- Enhanced security features including TPM1.2/2.02, SmartCard Reader, HP Biosphere, HP Client Security, Self-Encrypting storage drives, and optional Fingerprint reader
- LED-backlit display
  HP ProBook 640: 14.0" diagonal HD and FHD or Touch FHD with camera and with WWAN
  HP ProBook 650: 15.6" diagonal HD and FHD or Touch FHD with camera and with WWAN
- Optional HD webcam with dual-microphone array for video conferencing
- DisplayPort 1.2 now native with integrated graphics
- Three USB 3.0 ports for fast data transfer from devices: 1 standard, 1 charging, and one USB-C™ charging port
- 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:
  - Broadband Wireless (WWAN)
  - Wireless LAN (WLAN)
  - Personal area network (WPAN Bluetooth®)
  - Near Field Communication (NFC)
- Choice of hard drives up to 1 TB or solid state drives up to 512 GB
- Passed MIL STD testing[1]

1. MIL STD 810G testing 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.
2. This product ships with TPM 1.2 with option to upgrade to TPM 2.0. Upgrade utility is expected to be available by the second half of 2016 via HP Customer Support.

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

Technical Specifications

PRODUCT NAMES

HP ProBook 640 G2 Notebook PC

HP ProBook 650 G2 Notebook PC

OPERATING SYSTEM

Preinstalled	**Windows 10 Pro 64[1]**
	Windows 10 Home 64[1]
	Windows 10 Home Single Language 64[1]
	Windows 10 Home64 (National Academic only)[1]
	Windows 10 Pro 64 (National Academic only)[1]
	NeoKylin Linux 64
	FreeDOS 2.0
Web-only Support	**Windows 10 Enterprise 64[1]**

1. **Not all features are available in all editions or versions of Windows. Systems may require upgraded and/or separately purchased hardware, drivers, software or BIOS update to take full advantage of Windows functionality. Windows 10 is automatically updated, which is always enabled. ISP fees may apply and additional requirements may apply over time for updates. See http://www.microsoft.com.**
2. **This system is preinstalled with Windows 7 Professional software and also comes with a license and media for Windows 10 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**
3. **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. See http://www.microsoft.com.**

PROCESSORS

ProBook 640 G2
Intel® Core™ i7-6600U with Intel® HD Graphics 520
(2.6 GHz, up to 3.4 GHz with Intel® Turbo Boost Technology, 4 MB cache, 2 cores)[1,2] – Integrated with Chipset

Intel® Core™ i5-6300U with Intel® HD Graphics 520
(2.4 GHz, up to 3 GHz with Intel® Turbo Boost Technology, 3 MB cache, 2 cores) [1,2] – Integrated with Chipset

Intel® Core™ i5-6200U with Intel® HD Graphics 520
(2.3 GHz, up to 2.8 GHz with Intel® Turbo Boost Technology, 3 MB cache, 2 cores) [1,2] – Integrated with Chipset

Technical Specifications

Intel® Core™ i3-6100U with Intel® HD Graphics 520
(2.3 GHz, 3 MB cache, 2 cores) [1,2] – Integrated with Chipset

ProBook 650 G2

Intel® Core™ i7-6820HQ with Intel® HD Graphics 530
(2.7 GHz, up to 3.6 GHz with Intel® Turbo Boost Technology, 8 MB cache, 4 cores) [1,2] – QM170 Chipset

Intel® Core™ i5-6440HQ with Intel® HD Graphics 530
(2.6 GHz, up to 3.5 GHz with Intel® Turbo Boost Technology, 6 MB cache, 4 cores) [1,2] – QM170 Chipset

Intel® Core™ i7-6600U with Intel® HD Graphics 520
(2.6 GHz, up to 3.4 GHz with Intel® Turbo Boost Technology, 4 MB cache, 2 cores) [1,2] – Integrated with Chipset

Intel® Core™ i5-6300U with Intel® HD Graphics 520
(2.4 GHz, up to 3 GHz with Intel® Turbo Boost Technology, 3 MB cache, 2 cores) [1,2] – Integrated with Chipset

Intel® Core™ i5-6200U with Intel® HD Graphics 520
(2.3 GHz, up to 2.8 GHz with Intel® Turbo Boost Technology, 3 MB cache, 2 cores) [1,2] – Integrated with Chipset

Intel® Core™ i3-6100U with Intel® HD Graphics 520
(2.3 GHz, 3 MB cache, 2 cores) [1,2] – Integrated with Chipset

1. Multicore is designed to improve performance of certain software products. Not all customers or software applications will necessarily benefit from use of this technology. Performance and clock frequency will vary depending on application workload and your hardware and software configurations. Intel's numbering is not a measurement of higher performance.
2. Some vPro™ functionality, such as Intel® Active management technology and Intel Virtualization technology, requires additional 3rd party software in order to run. Availability of future "virtual appliances" applications for Intel vPro technology is dependent on 3rd party software providers. Microsoft Windows required.

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

CHIPSET

Integrated with processor or QM170

GRAPHICS

HP ProBook 640
Integrated:
Intel® HD[1] Graphics 520
Discrete:
AMD Radeon™ R7 M365X (2 GB GDDR5 dedicated)[2]

HP ProBook 650
Integrated:
Intel® HD[1] Graphics 520
Intel® HD[1] Graphics 530

Technical Specifications

Discrete:
AMD Radeon™ R7 M365X (2 GB GDDR5 dedicated)[2]

1. HD content required to view HD images.
2. AMD Dynamic Switchable Graphics technology requires an Intel processor, plus an AMD Radeon™ discrete graphics configuration and is not available on FreeDOS and Linux OS. 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). Planned to be available in February 2016.

DISPLAY

HP ProBook 640

Internal
Non-Touch
14.0" diagonal LED backlight HD[1] Anti-glare 45% CG 220 nits (1366x768)
14.0" diagonal LED backlight HD[1] Anti-glare 45% CG 220 nits (1366x768) with camera
14.0" diagonal LED backlight HD[1] Anti-glare 45% CG 220 nits (1366x768) with WWAN
14.0" diagonal LED backlight HD[1] Anti-glare 45% CG 220 nits (1366x768) with camera and with WWAN
14.0" diagonal LED backlight FHD Anti-glare 60% CG 300 nits (1920x1080)
14.0" diagonal LED backlight FHD Anti-glare 60% CG 300 nits (1920x1080) with camera
14.0" diagonal LED backlight FHD Anti-glare 60% CG 300 nits (1920x1080) with WWAN
14.0" diagonal LED backlight FHD Anti-glare 60% CG 300 nits (1920x1080) with camera & WWAN
Touch
14.0" diagonal LED backlight FHD 60% CG 300 nits (1920x1080) with camera and with WWAN
External
Up to 32-bit per pixel color depth
VGA
Port supports resolutions up to 1920 x 1200 external resolution @60 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

Number of Displays Supported
Supports 3 independent displays if used with optional HP Ultraslim Docking Station[2]

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

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

HP ProBook 650

Internal
Non-Touch

Technical Specifications

15.6" diagonal LED backlight HD[1] Anti-glare 45% CG 220 nits (1366 x 768)
15.6" diagonal LED backlight HD[1] Anti-glare 45% CG 220 nits (1366 x 768) with camera
15.6" diagonal LED backlight HD[1] Anti-glare 45% CG 220 nits (1366 x 768) with WWAN
15.6" diagonal LED backlight HD[1] Anti-glare 45% CG 220 nits (1366 x 768) with camera and with WWAN
15.6" diagonal LED backlight FHD Anti-glare 60% CG 300 nits (1920 x 1080)
15.6" diagonal LED backlight FHD Anti-glare 60% CG 300 nits (1920 x 1080) with camera
15.6" diagonal LED backlight FHD Anti-glare 60% CG 300 nits (1920 x 1080) with WWAN
15.6" diagonal LED backlight FHD Anti-glare 60% CG 300 nits (1920 x 1080) with camera & WWAN
Touch
15.6" diagonal LED backlight FHD 60% CG 300 nits (1920 x 1080) with camera with WWAN

External
Up to 32-bit per pixel color depth
VGA
Port supports resolutions up to 1920 x 1200 external resolution @60 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
Number of Displays Supported

Number of Displays with Optional[2] HP UltraSlim Docking Station	UMA	Discrete
ProBook 650	3	5

1. **HD content required to view HD images.**
2. **Sold separately or as an optional feature.**
   NOTE: Resolutions are dependent upon monitor capability, and resolution and color depth settings.

STORAGE AND DRIVES

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

Technical Specifications

500 GB 7200rpm Hard Drive	**Drive Weight**	**0.20 lbs (92 g)-0.21 lbs (95 g)**	
	Capacity	**500 GB**	
	Height	**0.28 in (7 mm)**	
	Width	**2.75 in (69.85 mm)**	
	Interface	**ATA-8, SATA 3.0**	
	Transfer Rate	**Synchronous (maximum)**	**600 MB/s**
	Seek Time (typical reads, including settling)	**Single Track**	**1.5ms-2.0ms**
		Average	**11ms-13ms**
		Maximum	**18ms-22ms**
	Cache	**32 MB**	
	Rotational Speed	**7200 rpm**	
	Logical Blocks	**976,773,168**	
	Operating Temperature	**32° to 140° F (0° to 60° C) [case temp]**	
	Features	**ATA Security**	
500 GB 7200rpm Self-Encrypting Drive (Opal 2)	**Drive Weight**	**0.21 lbs (95 g)**	
	Capacity	**500GB**	
	Height	**0.28 in (7 mm)**	
	Width	**2.75 in (69.85 mm)**	
	Interface	**ATA-8, SATA 3.0**	
	Transfer Rate	**Synchronous (maximum)**	**600 MB/s**
	Seek Time (typical reads, including settling)	**Single Track**	**1.5ms**
		Average	**12ms**
		Maximum	**18ms- 22ms**
	Cache	**32MB**	
	Rotational Speed	**7200 rpm**	
	Logical Blocks	**976,773,168**	
	Operating Temperature	**32° to 140° F (0° to 60° C) [top cover temp]**	
	Features	**ATA Security; TCG Opal 2.x, S.M.A.R.T., NCQ, Ultra DMA**	
1 TB 5400rpm Hard Drive	**Drive Weight**	**0.21 lbs (94 g)- 0.21 lbs (99 g)**	
	Capacity	**1TB**	
	Height	**0.28 in (7.2 mm)**	
	Width	**2.75 in (69.85 mm)**	
	Interface	**ATA-8, SATA 3.0**	
	Transfer Rate	**Synchronous (maximum)**	**600 MB/s**
		Single Track	**2ms**
		Average	**12ms-13ms**

Technical Specifications

	Seek Time (typical reads, including settling)	Maximum	18ms-23ms
	Cache	Up to 32GB	
	Rotational Speed	5400rpm	
	Logical Blocks	1,953,525,168	
	Operating Temperature	32° to 140° F (0° to 60° C) [case temp]	
	Features	S.M.A.R.T., NCQ, Ultra DMA	
500 GB Hybrid, 8 GB cache	Drive Weight	0.21 lb (95 g)	
	Capacity	500 GB	
	Height	0.276 in (7 mm)	
	Width	2.76 in (70.1 mm)	
	Interface	ATA-8, SATA 2.6, 6.0 Gb/s, NCQ	
	Transfer Rate	Synchronous (maximum)	600 MB/s (Drive Capability)
	Seek Time (typical reads, including settling)	Single Track	2 ms
		Average	12 ms
		Maximum	NIL ms
	Cache	64GB	
	Rotational Speed	5400 rpm	
	Logical Blocks	976,773,168	
	Operating Temperature	32° to 140° F (0° to 60° C) [case temp]	
	Features	ATA Security	
128 GB M2 2280 SATA-3 TLC Solid State Drive	Drive Weight	0.019 lb (8.5 g)-0.022 lb (10 g)	
	Capacity	128 GB	
	Height	0.09 in (2.23 mm)- 0.14 in (3.58 mm)	
	Width	0.87 in (22 mm)	
	Interface	ATA-8, SATA 3.0	
	Performance	Maximum Sequential Read	Maximum Sequential Write
		500 ~ 540 MB/s	130 ~ 450 MB/s
	Logical Blocks	250,069,680	
	Operating Temperature	32° to 158°F (0° to 70°C) [ambient temp]	
	Features	ATA Security, DIPM; TRIM; DEVSLP	
180 GB M2 2280 SATA-3 MLC Solid State Drive	Drive Weight	0.022 lb (<10 g)	
	Capacity	180 GB	
	Height	0.09 in (2.23 mm)	
	Width	0.87 in (22 mm)	
	Interface	ATA-8, SATA 3.0	

Technical Specifications

	Performance	Maximum Sequential Read	Maximum Sequential Write
		Up to 540 MB/s (Compressible Performance)	UP to 490 MB/s (Compressible Performance)
	Logical Blocks	351,651,888	
	Operating Temperature	32° to 158°F (0° to 70°C) [ambient temp]	
	Features	ATA Security, DIPM; TRIM; DEVSLP	
180 GB M2 2280 SATA-3 Self-Encrypting Drive (Opal 2) MLC Solid State Drive	Drive Weight	0.022 lb (<10 g)	
	Capacity	180GB	
	Height	0.09 in (2.23 mm)	
	Width	0.87 in (22 mm)	
	Interface	ATA-8, SATA 3.0	
	Performance	Maximum Sequential Read	Maximum Sequential Write
		540 MB/s	490 MB/s
	Logical Blocks	351,651,888	
	Operating Temperature	32° to 158°F (0° to 70°C) [ambient temp]	
	Features	ATA Security, TCG OPAL 2.x, DIPM; TRIM; DEVSLP	
240 GB SATA-3 MLC Solid State Drive	Drive Weight	0.02 lb (10 g)	
	Capacity	240 GB	
	Height	0.14 in (3.58 mm)	
	Width	0.87 in (22 mm)	
	Interface	ACS-3, SATA 3.2	
	Performance	Maximum Sequential Read	Maximum Sequential Write
		540 MB/s	490 MB/s
	Logical Blocks	468,862,128	
	Operating Temperature	32° to 158°F (0° to 70°C) [ambient temp]	
	Features	ATA Security, DIPM; TRIM; DEVSLP	
256 GB 2280 SATA-3 TLC Solid State Drive	Drive Weight	0.019 lb (8.5 g)- 0.022 lb (10 g)	
	Capacity	256GB	
	Height	0.09 in (2.3 mm)- 0.14 in (3.58 mm)	
	Width	0.87 in (22 mm)	
	Interface	ATA-8, SATA 3.0	
	Performance	Maximum Sequential Read	Maximum Sequential Write
		515 ~ 540 MB/s	260 ~ 515 MB/s
	Logical Blocks	500,118,192	
	Operating Temperature	32° to 158°F (0° to 70°C) [ambient temp]	
	Features	ATA Security, DIPM; TRIM; DEVSLP	

Technical Specifications

256 GB PCIe-3x4 NVMe Solid State Drive	**Drive Weight**	**0.02 lb (10 g)**	
	Capacity	**256 GB**	
	Height	**0.09 in (2.3 mm)**	
	Width	**0.87 in (22 mm)**	
	Interface	**PCIe NVMe Gen3X4**	
	Performance	**Maximum Sequential Read**	**Maximum Sequential Write**
		2260 ~3100 MB/s	**1100 ~ 1400 MB/s**
	Logical Blocks	**500,118,192**	
	Operating Temperature	**32° to 158°F (0° to 70°C) [ambient temp]**	
	Features	**ATA Security, TRIM; L1.2**	
256 GB M2 2280 SATA-3 Self-Encrypting Drive (Opal 2) MLC Solid State Drive	**Drive Weight**	**0.02 lb (10 g)**	
	Capacity	**256 GB**	
	Height	**0.14 in (3.58 mm)- 0.09 in (2.23 mm)**	
	Width	**0.87 in (22 mm)**	
	Interface	**ATA-8, SATA 3.0**	
	Performance	**Maximum Sequential Read**	**Maximum Sequential Write**
		450 ~ 540 MB/s	**370 ~ 500 MB/s**
	Logical Blocks	**500,118,192**	
	Operating Temperature	**32° to 158°F (0° to 70°C) [ambient temp]**	
	Features	**ATA Security; TCG Opal 2.0, DIPM; TRIM; DEVSLP**	
512 GB M2 2280 TLC Solid State Drive	**Drive Weight**	**0.019 lb (8.5 g)- 0.02 lb (10 g)**	
	Capacity	**512 GB**	
	Height	**0.09 in (2.3 mm)**	
	Width	**0.87 in (22 mm)**	
	Interface	**ATA-8, SATA 3.0**	
	Performance	**Maximum Sequential Read**	**Maximum Sequential Write**
		500 ~ 540 MB/s	**440 ~ 515 MB/s**
	Logical Blocks	**1,000,215,216**	
	Operating Temperature	**32° to 158°F (0° to 70°C) [ambient temp]**	
	Features	**ATA Security, DIPM; TRIM; DEVSLP**	
512 GB M2 2280 SATA-3 Self-Encrypting Drive (Opal 2) MLC Solid State Drive	**Drive Weight**	**0.019 lb (8.5 g)- 0.02 lb (10 g)**	
	Capacity	**512 GB**	
	Height	**0.09 in (2.3 mm)**	
	Width	**0.87 in (22 mm)**	
	Interface	**ATA-8, SATA 3.0**	
	Performance	**Maximum Sequential Read**	**Maximum Sequential Write**
		500 ~ 540 MB/s	**440 ~ 515 MB/s**

Technical Specifications

Logical Blocks	1,000,215,216
Operating Temperature	32° to 158°F (0° to 70°C) [ambient temp]
Features	ATA Security, DIPM; TRIM; DEVSLP; TCG Opal 2.0

OPTICAL DRIVES

Fixed 9.5 mm SATA
DVD-ROM Drive
DVD+/-RW SuperMulti DL[1]
Blu-ray ROM DVD+/-RW SuperMulti DL[1]
Weight saver[2]

1. For Blu-ray drives, certain disc, digital connection, compatibility and/or performance issues may arise, and do not constitute defects in the product. Flawless playback on all systems is not guaranteed. In order for some Blu-ray titles to play, they may require an HDMI digital connection and your display may require HDCP support. HD-DVD disks cannot be played on this drive. Note that DVD-RAM cannot read or write to 2.6 GB Single Sided/5.2 GB Double Sided – Version 1.0 media. Actual speeds may vary. Don't copy copyright-protected materials. Double Layer discs can store more data than single layer discs; discs burned with this drive may not be compatible with many existing single-layer DVD drives and players.
2. Not available on with Touch panel.

MEMORY

Standard
DDR4-2133 SDRAM (Transfer rates up to 2133 MT/s)
Two SODIMM slots supporting dual-channel memory

4096 MB Total System Memory (4096 MB x 1)
8192 MB Total System Memory (4096 MB x 2)
8192 MB Total System Memory (8192 MB x 1)
16384 MB Total System Memory (8192 MB x 2)
32768 MB Total System Memory (16384 MB x 2) (Available with 650 G2, planned to be available with 640 G2 2Q17)

Maximum
Up to 32768 MB with optional 16384 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.

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

Technical Specifications

Intel® Pro Wireless Display (WiDi Pro)[1]

1. Integrated Intel Wi-Di software is available on select models 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 VGA, HDMI cable, also sold separately

Broadband Wireless (WWAN) [2,3]
HP lt4120 Qualcomm® Snapdragon™ X5 LTE Mobile Broadband Module
HP hs3110 HSPA+ Mobile Broadband Module

Wireless LAN (WLAN)[1,2]
Options via Minicard
Intel® 802.11a/b/g/n/ac (2x2) and Bluetooth® 4.0 Combo
Broadcom 802.11a/b/g/n (2x2) and Bluetooth® 4.0 Combo
Realtek 802.11b/g/n (1x1) Wi-Fi

Personal area network (WPAN Bluetooth) [1,2]
Bluetooth® 4.0 supported via all combo cards (except for Intel® 802.11 ac Non-vPro)
Bluetooth® 4.1 supported via (Intel® 802.11 ac Non-vPro only)

Near Field Communication (NFC) Optional[2]
HP Module with NXP NFC Controller NPC100

Support for Miracast (Windows 8.1 and Windows 10)
Intel® Pro Wireless Display (WiDi Pro)

1. Wireless access point and Internet service is required and is not included. Availability of public wireless access points limited.
2. Sold separately or as an optional feature.
3. WWAN module is optional and 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, in all regions.

Communications[1]
Intel® I219LM 10/100/1000 Ethernet
Intel® I219V 10/100/1000 Ethernet

1. 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.

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

Technical Specifications

Stereo headphone/line out
Stereo microphone in

Webcam
Optional 720p HD webcam [1,2]

- **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 (subscription required and sold separately)**

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

KEYBOARDS/POINTING DEVICES/BUTTONS & FUNCTION KEYS

HP Premium 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. DuraKeys only available with Backlit option.

Three Keyboard options:
Touchpad, Spill-resistant with drain
Touchpad, Spill-resistant with drain, DuraKeys & Backlit
Dual Point, Spill-resistant with drain, DuraKeys & Backlit

Touchpad
On/Off button
Enabled by default
2F Scrolling – On
2F Zoom (Pinch) – On
OSD (enable / disable) – On
Win 8 2F tap = right click – On
Win 8 Edge Swipes – On

Buttons and Function Keys
F1 – Sleep
F2 – Blank
F3 – Backlit
F4 - Display Switch
F5 - Brightness down
F6 - Brightness up
F7 – Blank
F8 - Volume down

Technical Specifications

F9 - Volume up
F10 - Mic Mute
F11 – Bank
F12 - Num lock

SOFTWARE AND SECURITY

Preinstalled Software with Windows Operating System

BIOS

HP BIOSphere[1]
HP DriveLock | HP Automatic DriveLock
HP BIOS Protection[2]
BIOS Update via Network
Master Boot Record Security
Power On Authentication
Pre-Boot Security
Secure Erase[3]
Hybrid Boot
Measure Boot
Secure Boot
Absolute Persistence Module[4]
Pre-boot Authentication

Multi Media

Cyberlink Power DVD, BD
Cyberlink Power2Go (Secure Burn)
Cyberlink YouCam BE (Windows 7 only)

Communication

HP GPS and Location (Windows 7 only)[5]
HP Connection Manager with support for HP Mobile Connect (Windows 7 only)[6]
HP Mobile Connect Pro (Windows 8.1 and Windows 10 only)[6]
Intel® Wireless Display (WiDi) Software for Windows[7]
Native Miracast Support[8]

HP Value Add Software

HP 3D DriveGuard (requires Windows)
HP ePrint Driver[9]
HP Hotkey
HP Recovery Manager
HP Recovery Disc Creator
HP Registration App (Windows 8.1 only)

Technical Specifications

HP Support Assistant

HP Noise Reduction Software

3rd Party

Foxit PhantomPDF Express for HP

Microsoft Products

Buy Office
Bing Search
Skype[10]

Manageability

HP Driver Packs[11]
HP SoftPaq Download Manager (SDM)
HP System Software Manager (SSM)[11]
HP BIOS Config Utility (BCU)[11]
HP Client Catalog[11]
HP CIK for Microsoft SCCM[11]
LANDESK Management[12]

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

Client Security Software

HP Client Security

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

Microsoft Security Essentials[13]
Microsoft Defender

Security
Trusted Platform Module (TPM) 1.2 (Infineon SLB9670). Common Criteria EAL4+ Certified.
Upgradable to TPM 2.0. Convertible to FIPS 140-2 Certified mode. (TPM 2.0 is not available for Win 7 32-bit.)[14]
HP Fingerprint reader
Security lock slot
Integrated Smart Card Reader
For more information on HP Client Security Software Suite, refer to http://www.hp.com/go/clientsecurity.

1. Available only on business PCs with HP BIOS.
2. May require a manual recovery step if all copies of BIOS are compromised or deleted

Technical Specifications

3. For the methods outlined in the National Institute of Standards and Technology Special Publication 800-88.
4. Absolute agent is shipped turned off, and will be activated when customers activate a purchased subscription. Subscriptions can be purchased for terms ranging multiple years. Service is limited, check with Absolute for availability outside the U.S. The Absolute Recovery Guarantee is a limited warranty. Certain conditions apply. For full details visit: http://www.absolute.com/company/legal/agreements/ computrace-agreement. Data Delete is an optional service provided by Absolute Software. If utilized, the Recovery Guarantee is null and void. In order to use the Data Delete service, customers must first sign a Pre-Authorization Agreement and either obtain a PIN or purchase one or more RSA SecurID tokens from Absolute Software.
5. 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.
6. HP Mobile Connect Pro is only available on preconfigured devices with WWAN. For geographic availability refer to www.hp.com/go/mobileconnect
7. 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.
8. 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
9. 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.
10. Skype is not offered in China.
11. Not preinstalled, however available for download at http://www.hp.com/go/clientmanagement
12. Subscription required.
13. Opt in and internet connection required for updates.
14. This product ships with TPM 1.2 with option to upgrade to TPM 2.0. Upgrade utility is expected to be available by the end of 2015 via HP Customer Support

POWER

Power Supply
HP 45W Smart AC Adapter (UMA only)
HP 45W Smart AC Adapter (Only available for Japan and England)
HP 65W Smart AC Adapter
HP 65W Smart EM Adapter (only available for Asia, China and India)
Power cord included is 1.8 m (+/- 0.1 m) or 1.0 m (+/- 0.1 m).

Primary Battery
HP 3-cell Long Life Prismatic (48 WHr)

Battery Life[1]

HP ProBook 640 Notebook PC	UMA Graphics	Discrete Graphics

Technical Specifications

3-cell (48 Whr) with SSD	Up to 12 hrs 30 mins	Up to 12 hrs 15 mins
3-cell (48 Whr) with HDD	Up to 10 hrs	Up to 9 hrs 45 mins
HP ProBook 650 Notebook PC	UMA Graphics	Discrete Graphics
3-cell (48 Whr) with SSD	Up to 12 hrs 30 mins	Up to 12 hrs 15 mins
3-cell (48 Whr) with HDD	Up to 9 hrs 45 mins	Up to 9 hrs 45 mins

System Standby Time[2]

	UMA Graphics	Discrete Graphics
HP ProBook 640 Notebook PC	Up to 249 hrs	Up to 190 hrs
HP ProBook 650 Notebook PC	Up to 249 hrs	Up to 190 hrs

Battery recharge times

	ProBook 640 G2	ProBook 650 G2
Time to 90[3]% Charge (minutes)	113	113
Time to 100[4]% Charge (minutes)	163	163

1. Windows 10 MM14 battery life will vary depending on various 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.
2. Standy 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.
3. Recharges your battery up to 90% within 113 minutes when the system is off. Applies to 3-cell 48Whr battery only. When the PC is powered on, charge time may increase and will vary based on the workload of the notebook PC.
4. Recharges your battery up to 100% within 163 minutes when the system is off. Applies to 3-cell 48Whr battery only. When the PC is powered on, charge time may increase and will vary based on the workload of the notebook PC.

WEIGHTS & DIMENSIONS

HP ProBook 640 Notebook PC
Weight
Starting at 4.30 lbs (1.95 kg)[1]
(3-cell battery, ODD weight saver, UMA, no FPR, 1 SODIMM, WLAN only, SSD, touchpad only, no camera, no WWAN)

Technical Specifications

Dimensions (w x d x h)
13.39 x 9.33 x 1.06 in (Front and rear)[2]
34.0 x 23.7 x 27.0 cm (Front and rear) [2]

HP ProBook 650 Notebook PC
Weight
Starting at 5.10 lbs (2.31 kg)[1]
(3-cell battery, ODD weight saver, UMA, no FPR, 1 SODIMM, WLAN only, SSD, touchpad only, no camera, no WWAN)

Dimensions (w x d x h)
14.88 x 10.11 x 27.40 in) (Front and rear)[2]
37.8 x 25.70 x 2.74 cm) (Front and rear)[2]

1. **Weight varies by configuration and components.**
2. **Height varies depending upon where on the notebook the measurement is made.**

PORTS/SLOTS

Ports
USB Type-C™ - One
USB 3.0 port – One
USB 3.0 Port Charging – One
RJ-45 / Ethernet - One
Docking connector – One
Headphone / Microphone (Combo jack) – One
AC port (4.5mm) – One
DisplayPort 1.2 -One
VGA port – One
Serial port optional – One (only available on HPProBook 650) [1]

1. Sold separately or as an optional feature.

SD Media Reader Slot
Supports SD, SDHC, SDXC

SERVICE AND SUPPORT

Limited 3-year, 1-year or 90-day limited warranty options available, depending on country. Batteries have a default one year limited warranty except for Long Life batteries which will have same 1-year or 3-year limited warranty as the platform.Optional[1] HP Care Pack Services[2] 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/qp/cpc.

1. Sold separately or as an optional feature.
2. 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

SYSTEM UNIT

TBD

Technical Specifications

DISPLAYS*

14.0 FHD AG WLED SVA 60%cg 300nits eDP Slim

Panel	
Active Area (W x H)	309.40 x 173.95 (mm)
Dimensions (W x H)	320.9 x 205.6 (mm) max
Diagonal Size	14 (inch)
Thickness	3.0 (mm) max
Weight	270 g max
Interface	eDP 1.2
Surface Treatment	Anti-Glare (AG)
Contrast Ratio	300:1 (typical)
Refresh Rate	60 Hz
Brightness	300 nits
Pixel Resolution - Format	1920 x 1080 (FHD)
PPI	157
Pixel Resolution - Configuration	RGB
Backlight	LED
Color Gamut Coverage	60%
Color Depth	6 bits
Viewing Angle	SVA 45/45/25/35

14.0 HD AG WLED SVA 45%cg 220nits eDP Flat

Panel	
Active Area (W x H)	309.40 x 173.95 (mm)
Dimensions (W x H)	320.9 x 205.6 (mm) max

Technical Specifications

Diagonal Size	**14 (inch)**
Thickness	**3.6 (mm) max**
Weight	**320 g max**
Interface	**eDP 1.2**
Surface Treatment	**Anti-Glare (AG)**
Contrast Ratio	**300:1 (typical)**
Refresh Rate	**60 Hz**
Brightness	**220 nits**
Pixel Resolution - Format	**1280 x 768 (HD)**
PPI	**112**
Pixel Resolution - Configuration	**RGB**
Backlight	**LED**
Color Gamut Coverage	**45%**
Color Depth	**6 bits + Hi FRC**
Viewing Angle	**SVA 45/45/25/35**

14.0 FHD WLED SVA 60%cg 300nits eDP Slim Touch

Panel	
Active Area (W x H)	**309.40 x 173.95 (mm)**
Dimensions (W x H)	**320.9 x 205.6 (mm) max**
Diagonal Size	**14 (inch)**
Thickness	**3.0 (mm) max**
Weight	**270 g max**
Interface	**eDP 1.2**
Contrast Ratio	**300:1 (typical)**
Refresh Rate	**60 Hz**

Technical Specifications

Brightness	**300 nits**
Pixel Resolution - Format	**1920 x 1080 (FHD)**
PPI	**157**
Pixel Resolution - Configuration	**RGB**
Backlight	**LED**
Color Gamut Coverage	**60%**
Color Depth	**6 bits**
Viewing Angle	**SVA 45/45/25/35**
Touch Enabled	**Optional**
Other Features	**AS**
Pen Enabled	**No**

15.6 FHD AG WLED SVA 60%cg 300nits eDP Slim 3.2mm

Panel	
Active Area (W x H)	**344.2 x 193.5 (mm)**
Dimensions (W x H)	**360 x 224.3 (mm) max**
Diagonal Size	**15.6 (inch)**
Thickness	**3.2 (mm) max**
Weight	**360 g max**
Interface	**eDP 1.2**
Surface Treatment	**Anti-Glare (AG)**
Contrast Ratio	**400:1 (typical)**
Refresh Rate	**60 Hz**
Brightness	**300 nits**
Pixel Resolution - Format	**1920 x 1080 (FHD)**
PPI	**142**

Technical Specifications

Pixel Resolution - Configuration	**RGB**
Backlight	**LED**
Color Gamut Coverage	**60%**
Color Depth	**6 bits**
Viewing Angle	**SVA 45/45/25/35**

15.6 HD AG WLED SVA 45%cg 220nits eDP Flat

Panel	
Active Area (W x H)	**344.2 x 193.5 (mm)**
Dimensions (W x H)	**360 x 224.3 (mm) max**
Diagonal Size	**15.6 (inch)**
Thickness	**3.8 (mm) max**
Weight	**420 g max**
Interface	**eDP 1.2**
Surface Treatment	**Anti-Glare (AG)**
Contrast Ratio	**300:1 (typical)**
Refresh Rate	**60 Hz**
Brightness	**220 nits**
Pixel Resolution - Format	**1280 x 768 (HD)**
PPI	**101**
Pixel Resolution - Configuration	**RGB**
Backlight	**LED**
Color Gamut Coverage	**45%**
Color Depth	**6 bits + Hi FRC**
Viewing Angle	**SVA 45/45/25/35**

Technical Specifications

15.6 FHD WLED SVA 60%cg 300nits eDP Slim 3.2mm Touch

Panel	
Active Area (W x H)	**344.2 x 193.5 (mm)**
Dimensions (W x H)	**360 x 224.3 (mm) max**
Diagonal Size	**15.6 (inch)**
Thickness	**3.2 (mm) max**
Weight	**360 g max**
Interface	**eDP 1.2**
Contrast Ratio	**400:1 (typical)**
Refresh Rate	**60 Hz**
Brightness	**300 nits**
Pixel Resolution - Format	**1920 x 1080 (FHD)**
PPI	**142**
Pixel Resolution - Configuration	**RGB**
Backlight	**LED**
Color Gamut Coverage	**60%**
Color Depth	**6 bits**
Viewing Angle	**SVA 45/45/25/35**
Touch Enabled	**Optional**
Other Features	**AS**
Pen Enabled	**No**

*** ALL SPECIFICATIONS REPRESENT THE TYPICAL SPECIFICATIONS PROVIDED BY HP'S COMPONENT MANUFACTURERS; ACTUAL PERFORMANCE MAY VARY EITHER HIGHER OR LOWER.**

NETWORKING/COMMUNICATIONS

HP lt4120 Qualcomm® Snapdragon™ X5 LTE Mobile Broadband Module*

Technical Specifications

Technology/Operating bands	**LTE: 2100 (Band 1), 1900 (Band 2), 1800 (Band 3), 1700/2100 (Band 4), 850 (Band 5), 2600 (Band 7), 900 (Band 8), 700 (Band 12 lower), 700 (Band 13 upper), 700 (Band 17 lower), 800 (Band 20), 700 (Band 28). HSPA+: 2100 (Band 1), 1900 (Band 2), 1700/2100 (Band 4), 850 (Band 5), 900 (Band 8) MHz EV-DO: 850 (BC0), 1900 (BC1) MHz (Only work with Verizon network) E-GPRS: 1900 (Band 2), 1800 (Band 3), 850 (Band 5), 900 (Band 8) MHz**
Wireless protocol standards	**3GPP Release 10 LTE Specification CAT.4, 20MHz BW WCDMA R99, 3GPP Release 5, 6, 7 and 8 UMTS Specification 1xEVDO Release 0, A and B. E-GPRS: Class B, Multi-slot class 12, coding schemes CS1 - CS4 and MSC1 - MSC9**
GPS	**Standalone, A-GPS (MS-A, MS-B and XTRA)**
GPS bands	**1575.42 MHz ± 1.023 MHz, GLONASS 1596-1607MHz**
Maximum data rates	**LTE: 150 Mbps (Download), 50 Mbps (Upload) DC-HSPA+: 42 Mbps (Download), 5.76 Mbps (Upload) HSPA+: 21Mbps (Download), 5.76 Mbps (Upload) CDMA 1xRTT: 153.6 kbps (Download), 153.6 kbps (Upload) EVDO Rel.A: 3.1 Mbps (Download), 1.8 Mbps (Upload) EVDO Rel.B: 14.7 Mbps (Download), 5.4Mbps (Upload) EDGE: 236.8 kbps (Download), 236.8 kbps (Upload) GPRS: 85.6 kbps(Download), 85.6 kbps (Upload)**
Maximum output power	**LTE: 23 dBm HSPA+: 23.5 dBm 1xRTT/EVDO: 24dBm E-GPRS 1900/1800: 26 dBm E-GPRS 900/850: 27 dBm GPRS 1900/1800: 29.5 dBm GPRS 900/850: 32.5 dBm**
Maximum power consumption	**LTE: 1,200 mA (peak); 900 mA (average) HSPA+: 1,100 mA (peak); 800 mA (average) 1xRTT/EVDO: 1,000 mA (peak); 700 mA (average) E-GPRS: 2,800 mA (peak); 500 mA (average)**
Form Factor	**M.2, 3042-S3 Key B**
Weight	**6.2 g**
Dimensions (Length x Width x Thickness)	**42 x 30 x 2.3 mm**

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

HP hs3110 HSPA+ Intel® Mobile Broadband Module*

Technical Specifications

Technology/Operating bands	**HSPA+: 2100 (Band1), 1900 (Band 2), 1700 (Band 4), 850 (Band 5), 900 (Band 8) MHz** **E-GPRS: 1900 (Band 2), 1800 (Band 3), 850 MHz (Band 5), 900 (Band 8) MHz**
Wireless protocol standards	**WCDMA R99, 3GPP Release 5, 6 and 7 UMTS Specification** **E-GPRS: Class B, Multi-slot class 33, coding schemes CS1 - CS4 and MSC1 - MSC9**
GPS	**Standalone, A-GPS**
GPS bands	**1575.42 MHz ± 1.023 MHz**
Maximum data rates	**HSPA+: 21.6 Mbps (Download), 5.76 Mbps (Upload)** **E-GPRS: 296 kbps (Download), 236.8 kbps (Upload)** **GPRS: 107 kbps (Download), 85.6 kbps (Upload)**
Maximum output power	**HSPA+: 24 dBm** **E-GPRS 1800/1900: 26 dBm** **E-GPRS 850/900: 27 dBm** **GPRS 1800/1900: 30 dBm** **GPRS 850/900: 33 dBm**
Maximum power consumption	**HSPA+: 1,100 mA (peak); 800 mA (average)** **E-GPRS: 2,800 mA (peak); 700 mA (average)**
Form Factor	**M.2, 3042-S3 Key B**
Weight	**6 g**
Dimensions (Length x Width x Thickness)	**1.65 x 1.18 x 0.09 in (42 x 30 x 2.3 mm)**

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

Intel® 802.11a/b/g/n/ac (2x2) and Bluetooth® 4.1 Combo

Wireless LAN Standards	**IEEE 802.11a** **IEEE 802.11b** **IEEE 802.11g** **IEEE 802.11n** **IEEE 802.11ac**
Interoperability	**Wi-Fi certified**
Frequency Band	**802.11b/g/n** • **2.402 – 2.482 GHz** **Note:** **The FCC has declared as of January 1, 2015 products that utilize passive scanning on channel 12/13 and are capable of transmitting must fully comply with requirements of 15.247 or otherwise disable those channels.**

Technical Specifications

	802.11a/n • **4.9 – 4.95 GHz (Japan)** • **5.15 – 5.25 GHz** • **5.25 – 5.35 GHz** • **5.47 – 5.725 GHz** • **5.825 – 5.850 GHz** **Note: Indonesia no support this band)**
Data Rates	• **802.11b: 1, 2, 5.5, 11 Mbps** • **802.11g: 6, 9, 12, 18, 24, 36, 48, 54 Mbps** • **802.11a: 6, 9, 12, 18, 24, 36, 48, 54 Mbps** • **802.11n: MCS 0 ~ MCS 15, (20MHz, and 40MHz)** • **802.11ac : MCS0 ~ MCS9, (1SS, and 2SS) (20MHz, 40MHz, and 80MHz)**
Modulation	**Direct Sequence Spread Spectrum** **BPSK, QPSK, CCK, 16-QAM, 64-QAM, 256-QAM**
Security[1]	• **IEEE and WiFi compliant 64 / 128 bit WEP encryption for a/b/g mode only** • **AES-CCMP: 128 bit in hardware** • **802.1x authentication** • **WPA, WPA2: 802.1x. WPA-PSK, WPA2-PSK, TKIP, and AES.** • **WPA2 certification** • **IEEE 802.11i** • **Cisco Certified Extensions, all versions through CCX4 and CCX Lite** • **WAPI**
Network Architecture	**Ad-hoc (Peer to Peer)**
Models	**Infrastructure (Access Point Required)**
Roaming	**IEEE 802.11 compliant roaming between access points**
Output Power[2]	• **802.11b : +16dBm minimum** • **802.11g : +14dBm minimum** • **802.11a : +14dBm minimum** • **802.11n HT20(2.4GHz) : +14dBm minimum** • **802.11n HT40(2.4GHz) : +12dBm minimum** • **802.11n HT20(5GHz) : +14dBm minimum** • **802.11n HT40(5GHz) : +12dBm minimum**
Power Consumption	**Transmit: 2.0 W (max)** **Receive: 1.6 W (max)** **Idle mode (PSP): 180 mW (WLAN Associated)** **Idle mode: 50 mW (WLAN unassociated)**

Technical Specifications

	Connect Standby: 10 mW (WLAN+BT)
	Radio disabled: 5 mW
Power Management	**ACPI and PCI Express compliant power management** **802.11 compliant power saving mode**
Receiver Sensitivity[3]	**802.11b, 1Mbps : -94dBm maximum**
	802.11b, 11Mbps : -86dBm maximum
	802.11g, 6Mbps : -88dBm maximum
	802.11g, 54Mbps : -74dBm maximum
	802.11a, 6Mbps : -88dBm maximum
	802.11a, 54Mbps : -74dBm maximum
	802.11n, MCS07 : -69dBm maximum
	802.11n, MCS15 : -66dBm maximum
	802.11ac, 1SS, MCS-0 : -86dBm maximum
	802.11ac, 1SS, MCS-9 : -61dBm maximum
	802.11ac, 2SS, MCS-0 : -83dBm maximum
	802.11ac, 2SS, MCS-9 : -58dBm maximum
Antenna type	**High efficiency antenna with spatial diversity, mounted in the display enclosure**
	Two embedded dual band 2.4/5 GHz antennas are provided to the card to support WLAN MIMO communications and Bluetooth communications
Form Factor	**PCI-Express M.2 MiniCard**
Dimensions	**Type 2230 : 2.3 x 22.0 x 30.0 mm**
	Or **Type 1630 : 2.3 x 16.0 x 30.0 mm**
Weight	**Type 2230 : 2.8g**
	Or
	Type 1630 : 2g

Technical Specifications

Operating Voltage	**3.3v +/- 9%**	
Temperature	**Operating**	**14° to 158° F (–10° to 70° C)**
	Non-operating	**–40° to 176° F (–40° to 80° C)**
Humidity	**Operating**	**10% to 90% (non-condensing)**
	Non-operating	**5% to 95% (non-condensing)**
Altitude	**Operating**	**0 to 10,000 ft (3,048 m)**
	Non-operating	**0 to 50,000 ft (15,240 m)**
LED Activity	**LED Amber – Radio OFF; LED White – Radio ON**	

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

HP Integrated Module with Bluetooth 4.0/4.1/4.2 Wireless Technology

Bluetooth Specification	**4.0/4.1/4.2 Compliant**
Frequency Band	**2402 to 2480 MHz**
Number of Available Channels	**Legacy : 0~79 (1 MHz/CH)**
	BLE : 0~39 (2 MHz/CH)
Data Rates and Throughput	**Legacy : 3 Mbps data rate; throughput up to 2.17 Mbps**
	BLE : 1 Mbps data rate; throughput up to 0.2 Mbps
	Legacy : Synchronous Connection Oriented links up to 3, 64 kbps, voice channels
	Legacy : Asynchronous Connection Less links 2178.1 kbps/177.1 kbps asymmetric (3-DH5) or 864 kbps symmetric (3-EV5)
Transmit Power	**The Bluetooth component shall operate as a Class II Bluetooth device with a maximum transmit power of + 4 dBm for BR and EDR.**

Receiver Sensitivity

Legacy

Modulation	0.01% BER	0.001% BER
GFSK	-80 dBm	-70 dBm
π/4-DQPSK	-80 dBm	-70 dBm

Technical Specifications

	8DPSK	-80 dBm	-70 dBm

Power Consumption	Peak (Tx) 330 mW Peak (Rx) 230 mW Selective Suspend 17 mW
Range	Legacy Up to 33 ft (10 m)
	BLE Up to 99 ft (30 m)
Electrical Interface	USB 2.0 compliant
Bluetooth Software Supported	Microsoft Windows Bluetooth Software
Link Topology	
Electrical Interface	Point to Point, Multipoint Pico Nets up to 7 slaves
Bluetooth Software Supported	Full support of Bluetooth Security Provisions
Security	
Power Management	Microsoft Windows ACPI, and USB Bus Support
Certifications	Self-configurable to optimize power conservation in all operating modes, including Standby, Hold, Park, and Sniff
Security	All necessary regulatory approvals for supported countries, including:
Certifications	FCC (47 CFR) Part 15C, Section 15.247 & 15.249
Bluetooth Profiles Supported	
Power Management	ETS 300 328, ETS 300 826
Certifications	Low Voltage Directive IEC950
	UL, CSA, and CE Mark
Certifications	Serial Port Profile (SPP)[1] Service Discovery Application Profile (SDAP) Dial-Up Networking (DUN)[1,2]
Bluetooth Profiles Supported	Generic Object Exchange Profile (GOEP)[1,2] Object Push Profile (OPP)[1,2] Hard Copy Cable Replacement (HCRP)[1,2] Personal Area Networking Profile (PAN)[1,2] Human Interface Device Profile (HID)[1,2]

	Hands Free Profile (HFP) Advanced Audio Distribution Profile (A2DP) Audio Video Remote Control Profile (AVRCP)
Bluetooth V4.1/V4.2 support feature	V4.1: ESR5/6/7 compliant V4.2: ESR8 compliant, LE Secure Connection – Basic.

Intel® 802.11a/b/g/n (2x2) and Bluetooth® 4.0 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 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)

Technical Specifications

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: MCS 0 ~ MCS 15, (20MHz, and 40MHz)**
Modulation	**Direct Sequence Spread Spectrum** **CCK, BPSK, QPSK, 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 CCX4 and CCX Lite** • **WAPI**
Sub-channels	**Multinational support with frequency bands and channels compliant to local regulations.**
Network Architecture	**Ad-hoc (Peer to Peer)**
Models	**Infrastructure (Access Point Required)**
Roaming	**IEEE 802.11 compliant roaming between band Access Points**
Output Power[2]	• **802.11b : +16dBm minimum** • **802.11g : +14dBm minimum** • **802.11a : +14dBm minimum** • **802.11n HT20(2.4GHz) : +13dBm minimum** • **802.11n HT40(2.4GHz) : +13dBm minimum** • **802.11n HT20(5GHz) : +12dBm minimum** • **802.11n HT40(5GHz) : +12dBm minimum**
Power Consumption	**Transmit: 2.0 W (max)** **Receive: 1.6 W (max)** **Idle mode (PSP): 180 mW (WLAN Associated)** **Idle mode: 60 mW (WLAN unassociated)** **Radio disabled: 30 mW**
Power Management	**ACPI and PCI Express compliant power management** **802.11 compliant power saving mode**

Technical Specifications

Receiver Sensitivity[3]	**802.11b, 1Mbps : -94dBm maximum** **802.11b, 11Mbps : -86dBm maximum** **802.11g, 6Mbps : -88dBm maximum** **802.11g, 54Mbps : -74dBm maximum** **802.11a, 6Mbps : -86dBm maximum** **802.11a, 54Mbps : -72dBm maximum** **802.11n, MCS07 : -69dBm maximum** **802.11n, MCS15 : -66dBm maximum**	
Antenna type	**High efficiency antenna with spatial diversity, mounted in the display enclosure** **Two embedded dual band 2.4/5 GHz antennas are provided to the card to support WLAN MIMO and Bluetooth communications**	
Form Factor	**PCI-Express M.2 MiniCard**	
Dimensions	**Type 2230 : 2.3 x 22.0 x 30.0 mm** **Or** **Type 1630 : 2.3 x 16.0 x 30.0 mm**	
Weight	**Type 2230 : 2.8g** **Or** **Type 1630 : 2g**	
Operating Voltage	**3.3v +/- 9%**	
Temperature	**Operating** **Non-operating**	**14° to 158° F (-10° to 70° C)** **-40° to 176° F (-40° to 80° C)**
Humidity	**Operating** **Non-operating**	**10% to 90% (non-condensing)** **5% to 95% (non-condensing)**
Altitude	**Operating** **Non-operating**	**0 to 10,000 ft (3,048 m)** **0 to 50,000 ft (15,240 m)**
LED Activity	**LED Amber - Radio OFF; LED White - Radio ON**	

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).

Technical Specifications

HP Integrated Module with Bluetooth 4.0+EDR Wireless Technology

Bluetooth Specification	**4.0+EDR Compliant**
Frequency Band	**2402 to 2480 MHz**
Number of Available Channels	**79 (1 MHz) available channels**
Data Rates and Throughput	**3 Mbps data rate; throughput up to 2.17 Mbps** **Synchronous Connection Oriented links up to 3, 64 kbps, voice channels** **Asynchronous Connection Less links 2178.1 kbps/177.1 kbps asymmetric or 1306.9 kbps symmetric**
Transmit Power	**The Bluetooth component shall operate as a Class II Bluetooth device with a maximum transmit power of +4 dBm for BR and EDR.**

Receiver Sensitivity

Modulation	0.01% BER	0.001% BER
GFSK	-80 dBm	-70 dBm
π/4-DQPSK	-80 dBm	-70 dBm
8DPSK	-80 dBm	-70 dBm

Power Consumption	**Peak (Tx) 330 mW** **Peak (Rx) 230 mW** **Selective Suspend 17 mW**
Range	**Up to 33 ft (10 m)**
Electrical Interface	**USB 2.0 compliant**
Bluetooth Software Supported	**Microsoft Windows Bluetooth Software**
Link Topology	
Electrical Interface	**Point to Point, Multipoint Pico Nets up to 7 slaves**
Bluetooth Software Supported	**Full support of Bluetooth Security Provisions**
Security	
Power Management	**Microsoft Windows ACPI, and USB Bus Support**

Technical Specifications

Power Management	**Self-configurable to optimize power conservation in all operating modes, including Standby, Hold, Park, and Sniff**
Certifications	
Security	**All necessary regulatory approvals for supported countries, including:**
Certifications	**FCC (47 CFR) Part 15C, Section 15.247 & 15.249**
Bluetooth Profiles Supported	
Power Management	**ETS 300 328, ETS 300 826**
Certifications	**Low Voltage Directive IEC950**
	UL, CSA, and CE Mark
Certifications	**Serial Port Profile (SPP)[1]** **Service Discovery Application Profile (SDAP)** **Dial-Up Networking (DUN)[1,2]** **Generic Object Exchange Profile (GOEP)[1,2]** **Object Push Profile (OPP)[1,2]** **File Transfer Profile (FTP)** **Synchronization Profile (SYNC)** **Hard Copy Cable Replacement (HCRP)[1,2]** **Personal Area Networking Profile (PAN)[1,2]** **Human Interface Device Profile (HID)[1,2]**
Bluetooth Profiles Supported	**FAX Profile (FAX)** **Basic Imaging Profile (BIP)[2]** **Headset Profile (HSP)** **Hands Free Profile (HFP)** **Advanced Audio Distribution Profile (A2DP)**
Bluetooth V4.1/V4.2 support feature	**V4.1: ESR5/6/7 compliant**
	V4.2: ESR8 compliant, LE Secure Connection – Basic.

Technical Specifications

Broadcom 802.11a/b/g/n (2x2) and Bluetooth® 4.0 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** **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: MCS 0 ~ MCS 15, (20MHz, and 40MHz)**
Modulation	**Direct Sequence Spread Spectrum** **CCK, BPSK, QPSK, 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**

Technical Specifications

	• Cisco Certified Extensions, all versions through CCX4 and CCX Lite • WAPI
Sub-channels	Multinational support with frequency bands and channels compliant to local regulations.
Network Architecture	Ad-hoc (Peer to Peer)
Models	Infrastructure (Access Point Required)
Roaming	IEEE 802.11 compliant roaming between band Access Points
Output Power[2]	• 802.11b : +16dBm minimum • 802.11g : +14dBm minimum • 802.11a : +14dBm minimum • 802.11n HT20(2.4GHz) : +13dBm minimum • 802.11n HT40(2.4GHz) : +13dBm minimum • 802.11n HT20(5GHz) : +12dBm minimum • 802.11n HT40(5GHz) : +12dBm minimum
Power Consumption	Transmit: 2.0 W (max) Receive: 1.6 W (max) Idle mode (PSP): 180 mW (WLAN Associated) Idle mode: 60 mW (WLAN unassociated) Radio disabled: 30 mW
Power Management	ACPI and PCI Express compliant power management 802.11 compliant power saving mode
Receiver Sensitivity[3]	802.11b, 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
Antenna type	High efficiency antenna with spatial diversity, mounted in the display enclosure Two embedded dual band 2.4/5 GHz antennas are provided to the card to support WLAN MIMO and Bluetooth communications
Form Factor	PCI-Express M.2 MiniCard

Technical Specifications

Dimensions	**Type 2230 : 2.3 x 22.0 x 30.0 mm** **Or** **Type 1630 : 2.3 x 16.0 x 30.0 mm**	
Weight	**Type 2230 : 2.8g** **Or** **Type 1630 : 2g**	
Operating Voltage	**3.3v +/- 9%**	
Temperature	**Operating** **Non-operating**	**14° to 158° F (-10° to 70° C)** **-40° to 176° F (-40° to 80° C)**
Humidity	**Operating** **Non-operating**	**10% to 90% (non-condensing)** **5% to 95% (non-condensing)**
Altitude	**Operating** **Non-operating**	**0 to 10,000 ft (3,048 m)** **0 to 50,000 ft (15,240 m)**
LED Activity	**LED Amber - Radio OFF; LED White - Radio ON**	

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 4.0+EDR Wireless Technology

Bluetooth Specification	**4.0+EDR Compliant**
Frequency Band	**2402 to 2480 MHz**
Number of Available Channels	**79 (1 MHz) available channels**
Data Rates and Throughput	**3 Mbps data rate; throughput up to 2.17 Mbps** **Synchronous Connection Oriented links up to 3, 64 kbps, voice channels** **Asynchronous Connection Less links 2178.1 kbps/177.1 kbps asymmetric or 1306.9 kbps symmetric**

Technical Specifications

Transmit Power

The Bluetooth component shall operate as a Class II Bluetooth device with a maximum transmit power of +4 dBm for BR and EDR.

Receiver Sensitivity

Modulation	0.01% BER	0.001% BER
GFSK	-80 dBm	-70 dBm
π/4-DQPSK	-80 dBm	-70 dBm
8DPSK	-80 dBm	-70 dBm

Power Consumption

Peak (Tx) 330 mW
Peak (Rx) 230 mW
Selective Suspend 17 mW

Range

Up to 33 ft (10 m)

Electrical Interface

USB 2.0 compliant

Bluetooth Software Supported

Microsoft Windows Bluetooth Software

Link Topology

Electrical Interface

Point to Point, Multipoint Pico Nets up to 7 slaves

Bluetooth Software Supported

Full support of Bluetooth Security Provisions

Security

Power Management

Microsoft Windows ACPI, and USB Bus Support

Power Management

Self-configurable to optimize power conservation in all operating modes, including Standby, Hold, Park, and Sniff

Certifications

Security

All necessary regulatory approvals for supported countries, including:

Certifications

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

Bluetooth Profiles Supported

Power Management

ETS 300 328, ETS 300 826

Certifications

Low Voltage Directive IEC950

Certifications

UL, CSA, and CE Mark

Technical Specifications

Bluetooth Profiles Supported	**Serial Port Profile (SPP)[1]** **Service Discovery Application Profile (SDAP)** **Dial-Up Networking (DUN)[1,2]** **Generic Object Exchange Profile (GOEP)[1,2]** **Object Push Profile (OPP)[1,2]** **File Transfer Profile (FTP)** **Synchronization Profile (SYNC)** **Hard Copy Cable Replacement (HCRP)[1,2]** **Personal Area Networking Profile (PAN)[1,2]** **Human Interface Device Profile (HID)[1,2]** **FAX Profile (FAX)** **Basic Imaging Profile (BIP)[2]** **Headset Profile (HSP)** **Hands Free Profile (HFP)** **Advanced Audio Distribution Profile (A2DP)**

Broadcom 802.11b/g/n (1x1) WiFi and Bluetooth® 4.0 Combo

Wireless LAN Standards	**IEEE 802.11b** **IEEE 802.11g** **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 September 1, 2014 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.**
Data Rates	**802.11b: 1, 2, 5.5, 11 Mbps** **802.11g: 6, 9, 12, 18, 24, 36, 48, 54 Mbps** **802.11n: MCS 0 ~ MCS 07, (20MHz)**
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 CCX4 and CCX Lite • WAPI
Network Architecture	Ad-hoc (Peer to Peer)
Models	Infrastructure (Access Point Required)
Roaming	IEEE 802.11 compliant roaming between access points
Output Power[2]	• 802.11b : +16dBm minimum • 802.11g : +14dBm minimum • 802.11n HT20(2.4GHz) : +13dBm minimum • 802.11n HT40(2.4GHz) : +13dBm minimum • 802.11n HT20(5GHz) : +12dBm minimum • 802.11n HT40(5GHz) : +12dBm minimum
Power Consumption	Transmit: 2.0 W (max) Receive: 1.6 W (max) Idle mode (PSP): 180 mW (WLAN Associated) Idle mode: 60 mW (WLAN unassociated) Radio disabled: 30 mW
Power Management	ACPI and PCI Express compliant power management 802.11 compliant power saving mode
Receiver Sensitivity[3]	802.11b, 1Mbps : -94dBm maximum 802.11b, 11Mbps : -86dBm maximum 802.11g, 6Mbps : -88dBm maximum 802.11g, 54Mbps : -74dBm maximum 802.11n, MCS07 : -69dBm maximum 802.11n, MCS15 : -66dBm maximum
Antenna type	High efficiency antenna with spatial diversity, mounted in the display enclosure Two embedded antennas for 2.4GHz are provided to the card to support WLAN and Bluetooth communications. (Support Dual antenna or Single antenna, depend on platform requirement)

Technical Specifications

Form Factor	**PCI-Express M.2 MiniCard**	
Dimensions	**Type 2230 : 2.3 x 22.0 x 30.0 mm**	
	Or **Type 1630 : 2.3 x 16.0 x 30.0 mm**	
Weight	**Type 2230 : 2.8g**	
	Or	
	Type 1630 : 2g	
Operating Voltage	**3.3v +/- 9%**	
Temperature	**Operating**	**14° to 158° F (–10° to 70° C)**
	Non-operating	**–40° to 176° F (–40° to 80° C)**
Humidity	**Operating**	**10% to 90% (non-condensing)**
	Non-operating	**5% to 95% (non-condensing)**
Altitude	**Operating**	**0 to 10,000 ft (3,048 m)**
	Non-operating	**0 to 50,000 ft (15,240 m)**
LED Activity	**LED Amber – Radio OFF; LED White – Radio ON**	

4. **Check latest software/driver release for updates on supported security features.**
5. **Maximum output power may vary by country according to local regulations.**
6. **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 4.0+EDR Wireless Technology

Bluetooth Specification	**4.0+EDR Compliant**
Frequency Band	**2402 to 2480 MHz**
Number of Available Channels	**79 (1 MHz) available channels**
Data Rates and Throughput	**3 Mbps data rate; throughput up to 2.17 Mbps**
	Synchronous Connection Oriented links up to 3, 64 kbps, voice channels
	Asynchronous Connection Less links 2178.1 kbps/177.1 kbps asymmetric or 1306.9 kbps symmetric

Technical Specifications

Transmit Power

The Bluetooth component shall operate as a Class II Bluetooth device with a maximum transmit power of +4 dBm for BR and EDR.

Receiver Sensitivity

Modulation	0.01% BER	0.001% BER
GFSK	-80 dBm	-70 dBm
π/4-DQPSK	-80 dBm	-70 dBm
8DPSK	-80 dBm	-70 dBm

Power Consumption

Peak (Tx) 330 mW
Peak (Rx) 230 mW
Selective Suspend 17 mW

Range

Up to 33 ft (10 m)

Electrical Interface

USB 2.0 compliant

Bluetooth Software Supported

Microsoft Windows Bluetooth Software

Link Topology

Electrical Interface

Point to Point, Multipoint Pico Nets up to 7 slaves

Bluetooth Software Supported

Full support of Bluetooth Security Provisions

Security

Power Management

Microsoft Windows ACPI, and USB Bus Support

Power Management

Self-configurable to optimize power conservation in all operating modes, including Standby, Hold, Park, and Sniff

Certifications

Security

All necessary regulatory approvals for supported countries, including:

Certifications

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

Bluetooth Profiles Supported

Power Management

ETS 300 328, ETS 300 826

Certifications

Low Voltage Directive IEC950

Certifications

UL, CSA, and CE Mark

Technical Specifications

Bluetooth Profiles Supported	**Serial Port Profile (SPP)[1]** **Service Discovery Application Profile (SDAP)** **Dial-Up Networking (DUN)[1,2]** **Generic Object Exchange Profile (GOEP)[1,2]** **Object Push Profile (OPP)[1,2]** **File Transfer Profile (FTP)** **Synchronization Profile (SYNC)** **Hard Copy Cable Replacement (HCRP)[1,2]** **Personal Area Networking Profile (PAN)[1,2]** **Human Interface Device Profile (HID)[1,2]** **FAX Profile (FAX)** **Basic Imaging Profile (BIP)[2]** **Headset Profile (HSP)** **Hands Free Profile (HFP)** **Advanced Audio Distribution Profile (A2DP)**

Realtek 802.11b/g/n (1x1) Wi-Fi

Wireless LAN Standards	**IEEE 802.11b** **IEEE 802.11g** **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 September 1, 2014 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.**
Data Rates	**802.11b: 1, 2, 5.5, 11 Mbps** **802.11g: 6, 9, 12, 18, 24, 36, 48, 54 Mbps** **802.11n: MCS 0 ~ MCS 07, (20MHz)**
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 CCX4 and CCX Lite • WAPI
Network Architecture	Ad-hoc (Peer to Peer)
Models	Infrastructure (Access Point Required)
Roaming	IEEE 802.11 compliant roaming between access points
Output Power[2]	• 802.11b : +16dBm minimum • 802.11g : +14dBm minimum • 802.11n HT20(2.4GHz) : +13dBm minimum • 802.11n HT40(2.4GHz) : +13dBm minimum • 802.11n HT20(5GHz) : +12dBm minimum • 802.11n HT40(5GHz) : +12dBm minimum
Power Consumption	Transmit: 2.0 W (max) Receive: 1.6 W (max) Idle mode (PSP): 180 mW (WLAN Associated) Idle mode: 60 mW (WLAN unassociated) Radio disabled: 30 mW
Power Management	ACPI and PCI Express compliant power management 802.11 compliant power saving mode
Receiver Sensitivity[3]	802.11b, 1Mbps : -94dBm maximum 802.11b, 11Mbps : -86dBm maximum 802.11g, 6Mbps : -88dBm maximum 802.11g, 54Mbps : -74dBm maximum 802.11n, MCS07 : -69dBm maximum 802.11n, MCS15 : -66dBm maximum
Antenna type	High efficiency antenna with spatial diversity, mounted in the display enclosure Two embedded antennas for 2.4GHz are provided to the card to support WLAN and Bluetooth communications. (Support Dual antenna or Single antenna, depend on platform requirement)

Technical Specifications

Form Factor	**PCI-Express M.2 MiniCard**	
Dimensions	**Type 2230 : 2.3 x 22.0 x 30.0 mm** **Or** **Type 1630 : 2.3 x 16.0 x 30.0 mm**	
Weight	**Type 2230 : 2.8g** **Or** **Type 1630 : 2g**	
Operating Voltage	**3.3v +/- 9%**	
Temperature	**Operating** **Non-operating**	**14° to 158° F (–10° to 70° C)** **–40° to 176° F (–40° to 80° C)**
Humidity	**Operating** **Non-operating**	**10% to 90% (non-condensing)** **5% to 95% (non-condensing)**
Altitude	**Operating** **Non-operating**	**0 to 10,000 ft (3,048 m)** **0 to 50,000 ft (15,240 m)**
LED Activity	**LED Amber – Radio OFF; LED White – Radio ON**	

7. **Check latest software/driver release for updates on supported security features.**
8. **Maximum output power may vary by country according to local regulations.**
9. **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 4.0+EDR Wireless Technology

Bluetooth Specification	**4.0+EDR Compliant**
Frequency Band	**2402 to 2480 MHz**
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Technical Specifications

Transmit Power

The Bluetooth component shall operate as a Class II Bluetooth device with a maximum transmit power of +4 dBm for BR and EDR.

Receiver Sensitivity

Modulation	0.01% BER	0.001% BER
GFSK	-80 dBm	-70 dBm
π/4-DQPSK	-80 dBm	-70 dBm
8DPSK	-80 dBm	-70 dBm

Power Consumption

Peak (Tx) 330 mW
Peak (Rx) 230 mW
Selective Suspend 17 mW

Range

Up to 33 ft (10 m)

Electrical Interface

USB 2.0 compliant

Bluetooth Software Supported

Microsoft Windows Bluetooth Software

Link Topology

Electrical Interface

Point to Point, Multipoint Pico Nets up to 7 slaves

Bluetooth Software Supported

Full support of Bluetooth Security Provisions

Security

Power Management

Microsoft Windows ACPI, and USB Bus Support

Power Management

Self-configurable to optimize power conservation in all operating modes, including Standby, Hold, Park, and Sniff

Certifications

Security

All necessary regulatory approvals for supported countries, including:

Certifications

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

Bluetooth Profiles Supported

Power Management

ETS 300 328, ETS 300 826

Certifications

Low Voltage Directive IEC950

Certifications

UL, CSA, and CE Mark

Technical Specifications

Bluetooth Profiles Supported	**Serial Port Profile (SPP)[1]** **Service Discovery Application Profile (SDAP)** **Dial-Up Networking (DUN)[1,2]** **Generic Object Exchange Profile (GOEP)[1,2]** **Object Push Profile (OPP)[1,2]** **File Transfer Profile (FTP)** **Synchronization Profile (SYNC)** **Hard Copy Cable Replacement (HCRP)[1,2]** **Personal Area Networking Profile (PAN)[1,2]** **Human Interface Device Profile (HID)[1,2]** **FAX Profile (FAX)** **Basic Imaging Profile (BIP)[2]** **Headset Profile (HSP)** **Hands Free Profile (HFP)** **Advanced Audio Distribution Profile (A2DP)**

ENVIRONMENTAL

HP ProBook 640 G2 Notebook PC

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** • **EPEAT <Gold> registered in the United States. See http://www.epeat.net for registration status in your country.**
System Configuration	**The configuration used for the Energy Consumption and Declared Noise Emissions data for the Notebook model is based on a "Typically Configured Notebook".**

Heat Dissipation*	**115VAC, 60Hz**	**230VAC, 50Hz**	**100VAC, 60Hz**
Normal Operation (Short idle)	25 BTU/hr	25 BTU/hr	24 BTU/hr
Normal Operation (Long idle)	16 BTU/hr	18 BTU/hr	17 BTU/hr
Sleep	3 BTU/hr	3 BTU/hr	3 BTU/hr
Off	1 BTU/hr	2 BTU/hr	1 BTU/hr

Technical Specifications

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

Declared Noise Emissions (in accordance with ISO 7779 and ISO 9296)	Sound Power (L_{WAd}, bels)	Sound Pressure (L_{pAm}, decibels)
Typically Configured – Idle	**3.1**	**24**
Fixed Disk – Random writes	**3.2**	**24**

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 96.0% recycle-able when properly disposed of at end of life.**

Packaging Materials

External:	**PAPER/Corrugated**	**366 g**
Internal:	**PLASTIC/EPE (Expanded Polyethylene)**	**42 g**
	PLASTIC/Polyethylene low density	**14.5 g**
	PLASTIC/Polypropylene	**3.2 g**

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

Material Usage

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

- **Asbestos**
- **Certain Azo Colorants**
- **Certain Brominated Flame Retardants – may not be used as flame retardants in plastics**

- Cadmium
- Chlorinated Hydrocarbons
- Chlorinated Paraffins
- Formaldehyde
- Halogenated Diphenyl Methanes
- Lead carbonates and sulfates
- Lead and Lead compounds
- Mercuric Oxide Batteries
- Nickel – finishes must not be used on the external surface designed to be frequently handled or carried by the user.
- Ozone Depleting Substances
- Polybrominated Biphenyls (PBBs)
- Polybrominated Biphenyl Ethers (PBBEs)
- 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.

Technical Specifications

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://h20195.www2.hp.com/V2/GetDocument.aspx?docname=c04755842** **and** **http://www.hp.com/hpinfo/globalcitizenship/environment/pdf/cert.pdf**

HP ProBook 650 G2 Notebook PC

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** • **EPEAT <Gold> registered in the United States. See http://www.epeat.net for registration status in your country.**
System Configuration	**The configuration used for the Energy Consumption and Declared Noise Emissions data for the Notebook model is based on a "Typically Configured Notebook".**

Heat Dissipation*	**115VAC, 60Hz**	**230VAC, 50Hz**	**100VAC, 60Hz**
Normal Operation (Short idle)	**29 BTU/hr**	**32 BTU/hr**	**29 BTU/hr**
Normal Operation (Long idle)	**19 BTU/hr**	**20 BTU/hr**	**19 BTU/hr**
Sleep	**2 BTU/hr**	**3 BTU/hr**	**2 BTU/hr**
Off	**1 BTU/hr**	**2 BTU/hr**	**1 BTU/hr**

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

Technical Specifications

Declared Noise Emissions (in accordance with ISO 7779 and ISO 9296)	Sound Power (L_{WAd}, bels)	Sound Pressure (L_{pAm}, decibels)
Typically Configured – Idle	3.0	19
Fixed Disk – Random writes	3.0	20

Longevity and Upgrading

This product can be upgraded, possibly extending its useful life by several years. Upgradeable features and/or components contained in the product may include:

- 3 USB ports
- 1 PC card slot (type I/II)
- 1 ExpressCard/54 slot
- 1 IEEE 1394 Port
- 2 SODIMM memory slots
- Optional expansion base docking station
- 1 multi-bay II storage port
- Interchangeable HDD

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

Batteries

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

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

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

Technical Specifications

Additional Information

- This product is in compliance with the Restrictions of Hazardous Substances (RoHS) directive - 2011/65/EC.
- This HP product is designed to comply with the Waste Electrical and Electronic Equipment (WEEE) Directive – 2002/96/EC.
- This product is in compliance with California Proposition 65 (State of California; Safe Drinking Water and Toxic Enforcement Act of 1986).
- This product is in compliance with the IEEE 1680 (EPEAT) standard at the <gold> level, see www.epeat.net
- Plastics parts weighing over 25 grams used in the product are marked per ISO11469 and ISO1043.
- This product contains 0% post-consumer recycled plastic (by wt.)
- This product is 96.5% recycle-able when properly disposed of at end of life.

Packaging Materials

External:	PAPER/Paper	360.2g
Internal:	PLASTIC/EPE (Expanded Polyethylene)	23.6 g
	PLASTIC/Polyethylene low density	13.6 g

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

Material Usage

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- Certain Brominated Flame Retardants – may not be used as flame retardants in plastics
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- Chlorinated Hydrocarbons
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Technical Specifications

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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

Technical Specifications

China

Summary of Changes

Options and Accessories (Sold separately and availability may vary by country.)

Type	Description	Part Number
Docking	**HP 3001pr USB 3.0 Port Replicator**	**F3S42AA**
	HP 3005pr USB 3.0 Port Replicator	**H1L08AA#xxx**
	HP Display and Notebook Stand II	**E8G00AA#xxx**
	Universal Port Replicator	**E6D70AA#xxx**
	HP UltraSlim Docking Station	**D9Y32AA#xxx**
Input/Output/Audio	HP USB Travel Mouse	G1K28AA#xxx
	HP Ultrathin Wireless Mouse SE	**L9V77AA**
	HP Ultrathin Wireless Mouse	**L9V78AA**
	HP Stereo USB Headset	**T1A67AA**
	DisplayPort to HDMI Adapter	**F3W43AA**
	DisplayPort to DVI Adapter	**F7W96AA**
Power	**HP 45W Smart AC Adapter (4.5mm)**	**H6Y88AA#xxx**
	HP 65W Smart AC Adapter	**H6Y89AA#xxx**
Storage - External Storage	**HP USB External DVDRW Drive**	**F2B56AA**
Security	**HP UltraSlim Keyed Cable Lock**	**H4D73AA**
	HP USB Smart Card Reader	**F6V67AA**
	HP Docking Station Cable Lock	**AU656AA#XXX**
Display	HP ProDisplay P232	**K7X31AA**
	HP ProDisplay P222va	**K7X30AA**
	HP ProDisplay P222c	**L4J08AA**

Summary of Changes