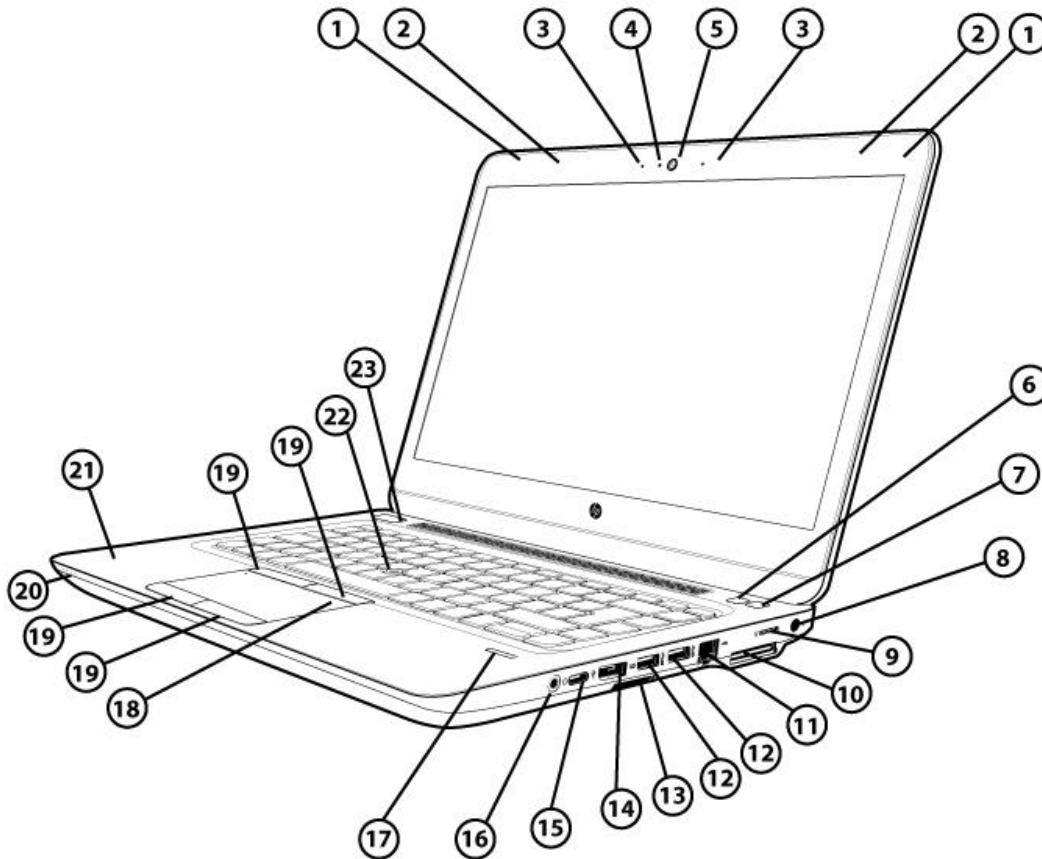


### Overview

#### HP ProBook 640 G2 Notebook PC

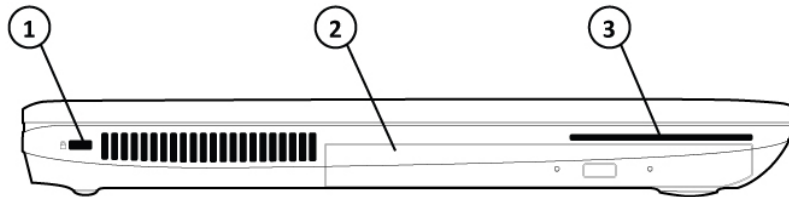


#### Front/Right

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



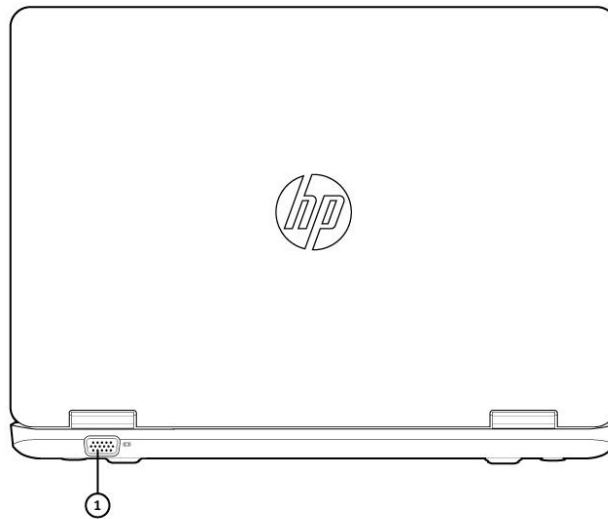
## Overview



1. Security lock slot
2. Optical drive

### Left

3. Smart Card Reader



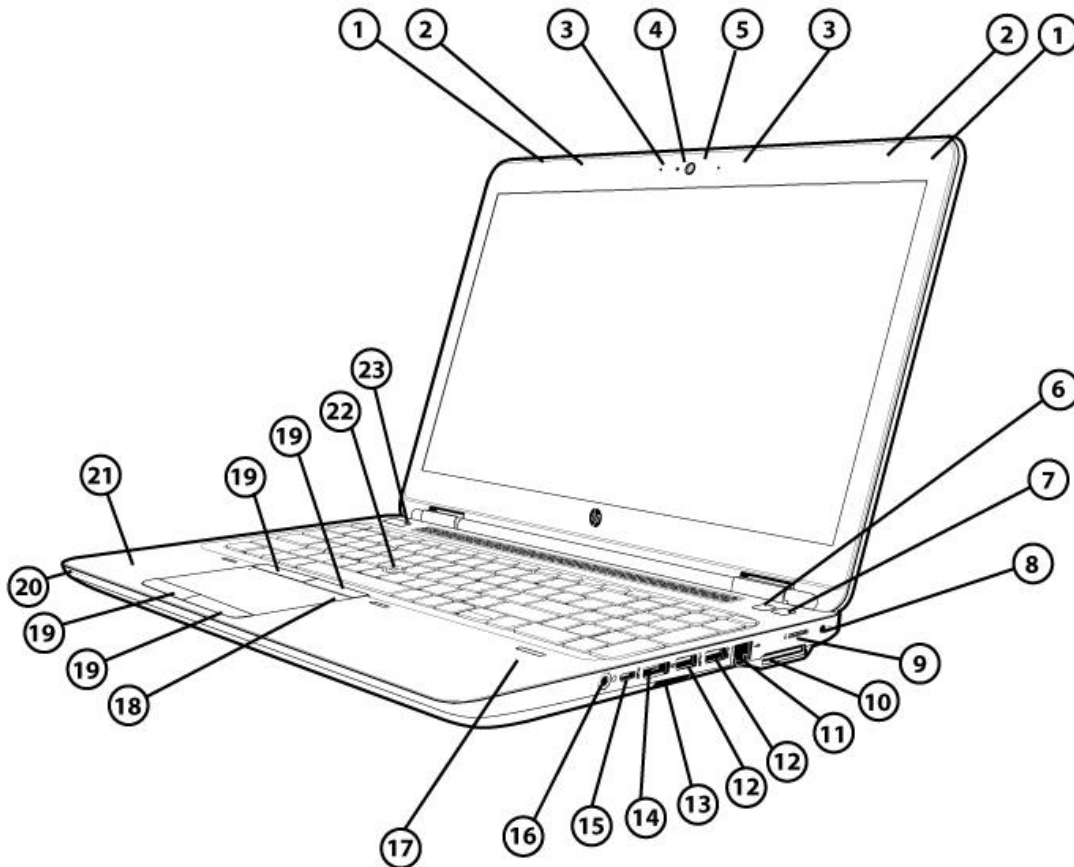
1. VGA port

### Back



### Overview

#### HP ProBook 650 G2 Notebook PC

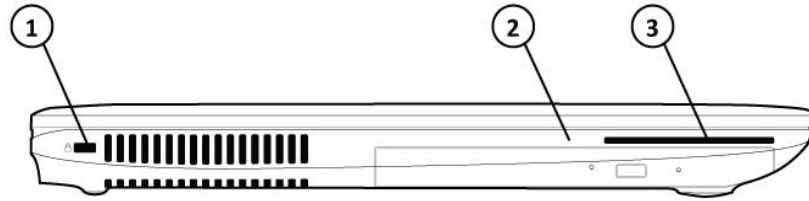


#### Front/Right

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



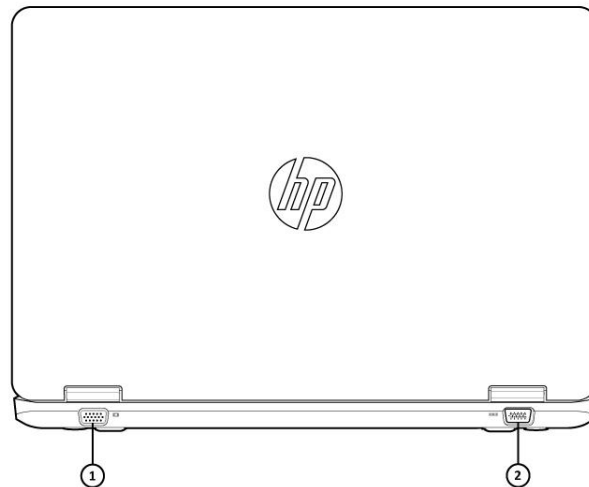
## Overview



- 1. Security lock slot
- 2. Optical drive

### Left

- 3. Smart card reader



- 1. VGA port

### Back

- 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–Acrylonitrile/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 HP Fingerprint Reader and TPM 1.2 Embedded Security Chip
- 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 (2 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

**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<sup>1</sup>  
Windows 10 Home 64<sup>1</sup>  
Windows 10 Home Single Language 64<sup>1</sup>  
Windows 10 Home64 (National Academic only)<sup>1</sup>  
Windows 10 Pro 64 (National Academic only)<sup>1</sup>  
Windows 8.1 Pro 64<sup>3</sup>  
Windows 8.1 Pro 64 (National Academic only)<sup>3</sup>  
Windows 8.1 64<sup>3</sup>  
Windows 7 Professional 64 (Available through downgrade rights from Windows 10 Pro 64)<sup>2</sup>  
Windows 7 Professional 32 (Available through downgrade rights from Windows 10 Pro 64)<sup>2</sup>  
Windows 7 Professional 32 (Available through downgrade rights from Windows 10 Pro 64)  
(National Academic only)<sup>2</sup>  
Windows 7 Professional 64 (Available through downgrade rights from Windows 10 Pro 64)  
(National Academic only)<sup>2</sup>  
Windows 7 Professional 64<sup>3</sup>  
Windows 7 Professional 32<sup>3</sup>  
Windows 7 Professional 32 (National Academic only)<sup>3</sup>  
Windows 7 Professional 64 (National Academic only)<sup>3</sup>  
NeoKylin Linux 64  
FreeDOS 2.0

#### Web-only Support

Windows 10 Enterprise 64<sup>1</sup>  
Windows 8.1 Enterprise 64<sup>1</sup>  
Windows 7 Enterprise 64<sup>1</sup>  
Windows 7 Enterprise 32<sup>1</sup>

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://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://http://www.microsoft.com>.



## Technical Specifications

### 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)<sup>1,2</sup>  
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)<sup>1,2</sup>  
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)<sup>1,2</sup>  
Intel® Core™ i3-6100U with Intel® HD Graphics 520  
(2.3 GHz, 3 MB cache, 2 cores)<sup>1,2</sup>

#### 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)<sup>1,2,3</sup>  
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)<sup>1,2,3</sup>  
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)<sup>1,2</sup>  
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)<sup>1,2</sup>  
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)<sup>1,2</sup>  
Intel® Core™ i3-6100U with Intel® HD Graphics 520  
(2.3 GHz, 3 MB cache, 2 cores)<sup>1,2</sup>

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.
3. Planned to be available February 2016.

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

### CHIPSET

Integrated with processor

### GRAPHICS

#### HP ProBook 640

##### Integrated:

Intel® HD<sup>1</sup> Graphics 520

##### Discrete:



## Technical Specifications

AMD Radeon™ R7 M365X (2 GB GDDR5 dedicated)<sup>2</sup>

### HP ProBook 650

#### Integrated:

Intel® HD<sup>1</sup> Graphics 520

Intel® HD<sup>1</sup> Graphics 530

#### Discrete:

AMD Litho Pro AMD Litho PRO (128-bit) w/2 GB GDDR5 (128Mb x 32, 1.35V, 5Gbps, Qty 4)<sup>2</sup>

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<sup>1</sup> Anti-glare (1366x768)

14.0" diagonal LED backlight HD<sup>1</sup> Anti-glare (1366x768) with camera

14.0" diagonal LED backlight HD<sup>1</sup> Anti-glare (1366x768) with WWAN

14.0" diagonal LED backlight HD<sup>1</sup> Anti-glare (1366x768) with camera and with WWAN

14.0" diagonal LED backlight FHD Anti-glare (1920x1080)

14.0" diagonal LED backlight FHD Anti-glare (1920x1080) with camera

14.0" diagonal LED backlight FHD Anti-glare (1920x1080) with WWAN

14.0" diagonal LED backlight FHD Anti-glare (1920x1080) with camera & WWAN

##### Touch

14.0" diagonal LED backlight FHD (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

Number of Displays with Optional <sup>2</sup> HP Advanced Docking Station	UMA	Discrete
ProBook 640	3	5

### HP ProBook 650

#### Internal

##### Non-Touch

15.6" diagonal LED backlight HD<sup>1</sup> Anti-glare (1366 x 768)



## Technical Specifications

- 15.6" diagonal LED backlight HD<sup>1</sup> Anti-glare (1366 x 768) with camera
- 15.6" diagonal LED backlight HD<sup>1</sup> Anti-glare (1366 x 768) with WWAN
- 15.6" diagonal LED backlight HD<sup>1</sup> Anti-glare (1366 x 768) with camera and with WWAN
- 15.6" diagonal LED backlight FHD Anti-glare (1920 x 1080)
- 15.6" diagonal LED backlight FHD Anti-glare (1920 x 1080) with camera
- 15.6" diagonal LED backlight FHD Anti-glare (1920 x 1080) with WWAN
- 15.6" diagonal LED backlight FHD Anti-glare (1920 x 1080) with camera & WWAN

### Touch

- 15.6" diagonal LED backlight FHD (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 <sup>2</sup> HP Advanced 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

### Primary Storage Bay

#### Hard Drives<sup>1</sup>

Supports SATA3, 7 mm

#### 2.5" Hard Drives<sup>1</sup>

- 500 GB 7200 rpm
- 500 GB 7200 rpm Self-Encrypting Drive (Opal 2)
- 500 GB 7200 rpm Self Encrypting Drive (Opal 2) (FIPS)
- 1 TB 5400 rpm
- 500 GB Hybrid

#### 2.5" Solid State Drive<sup>1</sup>

- 128 GB SATA TLC (Brazil only)
- 256 GB SATA TLC (Brazil only)

#### M.2 (NGFF) Solid State Drive<sup>1</sup>

- 128 GB SATA-3 TLC
- 180 GB SATA-3 MLC
- 180 GB SATA-3 MLC ( Opal 2 )



## Technical Specifications

240 GB SATA-3 MLC  
256 GB PCIe-3x4 DS NVMe  
256 GB SATA-3 MLC ( Opal 2 )  
256 GB SATA-3 TLC  
512 GB SATA-3 TLC

For hard drives and solid state drives, GB = 1 billion bytes. Actual formatted capacity is less.  
Up to 16 GB (for Windows 7) and up to 30 GB (for Windows 8 and 10) of system disk is reserved for the system recovery software.

## OPTICAL DRIVES

### Fixed 9.5 mm SATA

DVD-ROM Drive

DVD+/-RW SuperMulti DL<sup>1</sup>

Blu-ray ROM DVD+/-RW SuperMulti DL<sup>1</sup>

Weight saver<sup>2</sup>

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)

### Maximum

Up 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.

**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.



## Technical Specifications

### NETWORKING/COMMUNICATIONS

#### Intel® Pro Wireless Display (WiDi Pro)<sup>1</sup>

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)<sup>2,3</sup>

HP lt4120 Qualcomm® Snapdragon™ X5 LTE Mobile Broadband Module  
HP hs3110 HSPA+ Mobile Broadband Module

#### Wireless LAN (WLAN)<sup>1,2</sup>

Options via Minicard

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

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

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

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

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

#### Personal area network (WPAN Bluetooth)<sup>1,2</sup>

Bluetooth® 4.0 supported via all combo cards (except for Intel® 802.11 ac and Intel® 802.11 a/b/g/Non-vPro)

Bluetooth® 4.1 supported via (Intel® 802.11 ac and Intel® 802.11 a/b/g/n Non-vPro only)

#### Near Field Communication (NFC) Optional<sup>2</sup>

HP Module with NXP NFC Controller NPC100

#### Support for Miracast (Windows 8.1 and Windows 10)

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<sup>1</sup>

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)



## Technical Specifications

Function keys for microphone mute, volume up, volume down  
Stereo headphone/line out  
Stereo microphone in

### Webcam

Optional 720p HD webcam <sup>1,2</sup>

- 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



## Technical Specifications

F8 - Volume down  
F9 - Volume up  
F10 - Mic Mute  
F11 - Bank  
F12 - Num lock

## SOFTWARE AND SECURITY

### Preinstalled Software with Windows Operating System

#### BIOS

HP BIOSphere<sup>1</sup>  
HP DriveLock | HP Automatic DriveLock  
HP BIOS Protection<sup>2</sup>  
BIOS Update via Network  
Master Boot Record Security  
Power On Authentication  
Pre-Boot Security  
Secure Erase<sup>3</sup>  
Hybrid Boot  
Measure Boot  
Secure Boot  
Absolute Persistence Module<sup>4</sup>  
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)<sup>5</sup>  
HP Connection Manager with support for HP Mobile Connect (Windows 7 only)<sup>6</sup>  
HP Mobile Connect Pro (Windows 8.1 and Windows 10 only)<sup>6</sup>  
Intel® Wireless Display (WiDi) Software for Windows<sup>7</sup>  
Native Miracast Support<sup>8</sup>

#### HP Value Add Software

HP 3D DriveGuard (requires Windows)  
HP ePrint Driver<sup>9</sup>  
HP Hotkey  
HP Recovery Manager  
HP Recovery Disc Creator



## Technical Specifications

HP Registration App (Windows 8.1 only)  
HP Support Assistant  
HP Noise Reduction Software

### 3<sup>rd</sup> Party

Foxit PhantomPDF Express for HP

### Microsoft Products

Buy Office  
Bing Search  
Skype<sup>10</sup>

### Manageability

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

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<sup>13</sup>

Microsoft Defender

### Security

TPM 1.2/2.0<sup>14</sup>

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
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



### Technical Specifications

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 <http://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 <http://www.hp.com/go/eprintcenter>). Requires optional broadband module. Broadband use requires separately purchased service contract. Check with service provider for coverage and availability in your area. Separately purchased data plans or usage fees may apply. Print times and connection speeds may vary.

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

TBD

#### System Standby Time

TBD

### WEIGHTS & DIMENSIONS



### Technical Specifications

#### HP ProBook 640 Notebook PC

##### Weight

Starting at 4.30 lbs (1.95 kg)<sup>1</sup>

(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)

13.39 x 9.33 x 1.06 in (Front and rear)<sup>2</sup>

34.0 x 23.7 x 2.70 cm (Front and rear)<sup>2</sup>

#### HP ProBook 650 Notebook PC

##### Weight

Starting at 5.10 lbs ( 2.31 kg)<sup>1</sup>

(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)<sup>2</sup>

37.8 x 25.70 x 2.74 cm ) (Front and rear)<sup>2</sup>

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 HP ProBook 650)<sup>1</sup>

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<sup>1</sup> HP Care Pack Services<sup>2</sup> are extended service contracts which go beyond your standard limited warranties. To choose the right level of service for your HP product, use the HP Care Pack Services Lookup Tool at <http://www.hp.com/go/cpc>.

1. Sold separately or as an optional feature.
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.



## Technical Specifications

<http://h20000.www2.hp.com/bizsupport/TechSupport/ProductRoot.jsp>

### SYSTEM UNIT

TBD

### NETWORKING/COMMUNICATIONS

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

<b>Technology/Operating bands</b>	LTE: 2100 (Band 1), 1900 (Band 2), 1800 (Band 3), 1700/2100 (Band 4), 850 (Band 5), 2600 (Band 7), 900 (Band 8), 700 (Band 12 lower), 700 (Band 13 upper), 700 (Band 17 lower), 800 (Band 20), 700 (Band 28). HSPA+: 2100 (Band 1), 1900 (Band 2), 1700/2100 (Band 4), 850 (Band 5), 900 (Band 8) MHz EV-DO: 850 (BC0), 1900 (BC1) MHz (Only work with Verizon network) E-GPRS: 1900 (Band 2), 1800 (Band 3), 850 (Band 5), 900 (Band 8) MHz
<b>Wireless protocol standards</b>	3GPP Release 10 LTE Specification CAT.4, 20MHz BW WCDMA R99, 3GPP Release 5, 6, 7 and 8 UMTS Specification 1xEVDO Release 0, A and B. E-GPRS: Class B, Multi-slot class 12, coding schemes CS1 - CS4 and MSC1 - MSC9
<b>GPS</b>	Standalone, A-GPS (MS-A, MS-B and XTRA)
<b>GPS bands</b>	1575.42 MHz ± 1.023 MHz, GLONASS 1596-1607MHz
<b>Maximum data rates</b>	LTE: 150 Mbps (Download), 50 Mbps (Upload) DC-HSPA+: 42 Mbps (Download), 5.76 Mbps (Upload) HSPA+: 21Mbps (Download), 5.76 Mbps (Upload) CDMA 1xRTT: 153.6 kbps (Download), 153.6 kbps (Upload) EVDO Rel.A: 3.1 Mbps (Download), 1.8 Mbps (Upload) EVDO Rel.B: 14.7 Mbps (Download), 5.4Mbps (Upload) EDGE: 236.8 kbps (Download), 236.8 kbps (Upload) GPRS: 85.6 kbps(Download), 85.6 kbps (Upload)
<b>Maximum output power</b>	LTE: 23 dBm HSPA+: 23.5 dBm 1xRTT/EVDO: 24dBm E-GPRS 1900/1800: 26 dBm E-GPRS 900/850: 27 dBm GPRS 1900/1800: 29.5 dBm



### Technical Specifications

	GPRS 900/850: 32.5 dBm
<b>Maximum power consumption</b>	LTE: 1,200 mA (peak); 900 mA (average) HSPA+: 1,100 mA (peak); 800 mA (average) 1xRTT/EVDO: 1,000 mA (peak); 700 mA (average) E-GPRS: 2,800 mA (peak); 500 mA (average)
<b>Form Factor</b>	M.2, 3042-S3 Key B
<b>Weight</b>	6.2 g
<b>Dimensions</b> (Length x Width x Thickness)	42 x 30 x 2.3 mm

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

	<b>HP hs3110 HSPA+ Intel® Mobile Broadband Module*</b>
<b>Technology/Operating bands</b>	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
<b>Wireless protocol standards</b>	WCDMA R99, 3GPP Release 5, 6 and 7 UMTS Specification E-GPRS: Class B, Multi-slot class 33, coding schemes CS1 - CS4 and MSC1 - MSC9
<b>GPS</b>	Standalone, A-GPS
<b>GPS bands</b>	1575.42 MHz ± 1.023 MHz
<b>Maximum data rates</b>	HSPA+: 21.6 Mbps (Download), 5.76 Mbps (Upload)  E-GPRS: 296 kbps (Download), 236.8 kbps (Upload) GPRS: 107 kbps (Download), 85.6 kbps (Upload)
<b>Maximum output power</b>	HSPA+: 24 dBm E-GPRS 1800/1900: 26 dBm E-GPRS 850/900: 27 dBm GPRS 1800/1900: 30 dBm GPRS 850/900: 33 dBm
<b>Maximum power consumption</b>	HSPA+: 1,100 mA (peak); 800 mA (average) E-GPRS: 2,800 mA (peak); 700 mA (average)
<b>Form Factor</b>	M.2, 3042-S3 Key B
<b>Weight</b>	6 g
<b>Dimensions</b> (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



### Technical Specifications

<b>Wireless LAN Standards</b>	IEEE 802.11a  IEEE 802.11b IEEE 802.11g  IEEE 802.11n  IEEE 802.11ac
<b>Interoperability</b>	Wi-Fi certified
<b>Frequency Band</b>	802.11b/g/n <ul style="list-style-type: none"><li>2.402 – 2.482 GHz</li></ul> Note:  The FCC has declared as of January 1, 2015 products that utilize passive scanning on channel 12/13 and are capable of transmitting must fully comply with requirements of 15.247 or otherwise disable those channels.  802.11a/n <ul style="list-style-type: none"><li>4.9 – 4.95 GHz (Japan)</li><li>5.15 – 5.25 GHz</li><li>5.25 – 5.35 GHz</li><li>5.47 – 5.725 GHz</li><li>5.825 – 5.850 GHz</li></ul> Note: Indonesia no support this band)
<b>Data Rates</b>	<ul style="list-style-type: none"><li>802.11b: 1, 2, 5.5, 11 Mbps</li><li>802.11g: 6, 9, 12, 18, 24, 36, 48, 54 Mbps</li><li>802.11a: 6, 9, 12, 18, 24, 36, 48, 54 Mbps</li><li>802.11n: MCS 0 ~ MCS 15, (20MHz, and 40MHz)</li><li>802.11ac : MCS0 ~ MCS9, (1SS, and 2SS) (20MHz, 40MHz, and 80MHz)</li></ul>
<b>Modulation</b>	Direct Sequence Spread Spectrum BPSK, QPSK, CCK, 16-QAM, 64-QAM, 256-QAM
<b>Security<sup>1</sup></b>	<ul style="list-style-type: none"><li>IEEE and WiFi compliant 64 / 128 bit WEP encryption for a/b/g mode only</li><li>AES-CCMP: 128 bit in hardware</li><li>802.1x authentication</li><li>WPA, WPA2: 802.1x. WPA-PSK, WPA2-PSK, TKIP, and AES.</li><li>WPA2 certification</li><li>IEEE 802.11i</li></ul>



## Technical Specifications

	<ul style="list-style-type: none"> <li>• Cisco Certified Extensions, all versions through CCX4 and CCX Lite</li> <li>• WAPI</li> </ul>
<b>Network Architecture Models</b>	Ad-hoc (Peer to Peer) Infrastructure (Access Point Required)
<b>Roaming</b>	IEEE 802.11 compliant roaming between access points
<b>Output Power<sup>2</sup></b>	<ul style="list-style-type: none"> <li>• 802.11b : +16dBm minimum</li> <li>• 802.11g : +14dBm minimum</li> <li>• 802.11a : +14dBm minimum</li> <li>• 802.11n HT20(2.4GHz) : +14dBm minimum</li> <li>• 802.11n HT40(2.4GHz) : +12dBm minimum</li> <li>• 802.11n HT20(5GHz) : +14dBm minimum</li> <li>• 802.11n HT40(5GHz) : +12dBm minimum</li> </ul>
<b>Power Consumption</b>	Transmit: 2.0 W (max) Receive: 1.6 W (max) Idle mode (PSP): 180 mW (WLAN Associated) Idle mode: 50 mW (WLAN unassociated) Connect Standby: 10 mW (WLAN+BT) Radio disabled: 5 mW
<b>Power Management</b>	ACPI and PCI Express compliant power management 802.11 compliant power saving mode
<b>Receiver Sensitivity<sup>3</sup></b>	802.11b, 1Mbps : -94dBm maximum 802.11b, 11Mbps : -86dBm maximum 802.11g, 6Mbps : -88dBm maximum 802.11g, 54Mbps : -74dBm maximum 802.11a, 6Mbps : -88dBm maximum 802.11a, 54Mbps : -74dBm maximum 802.11n, MCS07 : -69dBm maximum



## Technical Specifications

	802.11n, MCS15 : -66dBm maximum
	802.11ac, 1SS, MCS-0 : -86dBm maximum
	802.11ac, 1SS, MCS-9 : -61 dBm maximum
	802.11ac, 2SS, MCS-0 : -83dBm maximum
	802.11ac, 2SS, MCS-9 : -58dBm maximum
<b>Antenna type</b>	High efficiency antenna with spatial diversity, mounted in the display enclosure
	Two embedded dual band 2.4/5 GHz antennas are provided to the card to support WLAN MIMO communications and Bluetooth communications
<b>Form Factor</b>	PCI-Express M.2 MiniCard
<b>Dimensions</b>	Type 2230 : 2.3 x 22.0 x 30.0 mm
	Or
	Type 1630 : 2.3 x 16.0 x 30.0 mm
<b>Weight</b>	Type 2230 : 2.8g
	Or
	Type 1630 : 2g
<b>Operating Voltage</b>	3.3v +/- 9%
<b>Temperature</b>	Operating 14° to 158° F (–10° to 70° C) Non-operating –40° to 176° F (–40° to 80° C)
<b>Humidity</b>	Operating 10% to 90% (non-condensing) Non-operating 5% to 95% (non-condensing)
<b>Altitude</b>	Operating 0 to 10,000 ft (3,048 m) Non-operating 0 to 50,000 ft (15,240 m)
<b>LED Activity</b>	LED Amber – Radio OFF; LED White – Radio ON

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

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



## Technical Specifications

<b>Bluetooth Specification</b>	4.0/4.1/4.2 Compliant												
<b>Frequency Band</b>	2402 to 2480 MHz												
<b>Number of Available Channels</b>	Legacy : 0~79 (1 MHz/CH) BLE : 0~39 (2 MHz/CH)												
<b>Data Rates and Throughput</b>	Legacy : 3 Mbps data rate; throughput up to 2.17 Mbps  BLE : 1 Mbps data rate; throughput up to 0.2 Mbps  Legacy : Synchronous Connection Oriented links up to 3, 64 kbps, voice channels  Legacy : Asynchronous Connection Less links 2178.1 kbps/177.1 kbps asymmetric (3-DH5) or 864 kbps symmetric (3-EV5)												
<b>Transmit Power</b>	The Bluetooth component shall operate as a Class II Bluetooth device with a maximum transmit power of + 4 dBm for BR and EDR.												
<b>Receiver Sensitivity</b>	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Modulation</th> <th style="text-align: center;">0.01% BER</th> <th style="text-align: center;">0.001% BER</th> </tr> </thead> <tbody> <tr> <td>Legacy GFSK</td> <td style="text-align: center;">-80 dBm</td> <td style="text-align: center;">-70 dBm</td> </tr> <tr> <td><math>\pi/4</math>-DQPSK</td> <td style="text-align: center;">-80 dBm</td> <td style="text-align: center;">-70 dBm</td> </tr> <tr> <td>8DPSK</td> <td style="text-align: center;">-80 dBm</td> <td style="text-align: center;">-70 dBm</td> </tr> </tbody> </table>	Modulation	0.01% BER	0.001% BER	Legacy GFSK	-80 dBm	-70 dBm	$\pi/4$ -DQPSK	-80 dBm	-70 dBm	8DPSK	-80 dBm	-70 dBm
Modulation	0.01% BER	0.001% BER											
Legacy GFSK	-80 dBm	-70 dBm											
$\pi/4$ -DQPSK	-80 dBm	-70 dBm											
8DPSK	-80 dBm	-70 dBm											
<b>Power Consumption</b>	Peak (Tx) 330 mW Peak (Rx) 230 mW Selective Suspend 17 mW												
<b>Range</b>	Legacy Up to 33 ft (10 m)  BLE Up to 99 ft (30 m)												
<b>Electrical Interface</b>	USB 2.0 compliant												
<b>Bluetooth Software Supported</b>	Microsoft Windows Bluetooth Software												
<b>Link Topology</b>													
<b>Electrical Interface</b>	Point to Point, Multipoint Pico Nets up to 7 slaves												
<b>Bluetooth Software Supported</b>	Full support of Bluetooth Security Provisions												



## Technical Specifications

**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)<sup>1</sup>  
 Service Discovery Application Profile (SDAP)  
 Dial-Up Networking (DUN)<sup>1,2</sup>  
 Generic Object Exchange Profile (GOEP)<sup>1,2</sup>  
 Object Push Profile (OPP)<sup>1,2</sup>  
 Hard Copy Cable Replacement (HCRP)<sup>1,2</sup>  
 Personal Area Networking Profile (PAN)<sup>1,2</sup>  
 Human Interface Device Profile (HID)<sup>1,2</sup>  
 Hands Free Profile (HFP)  
 Advanced Audio Distribution Profile (A2DP)

**Bluetooth Profiles Supported**

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**

IEEE 802.11a





### Technical Specifications

	<ul style="list-style-type: none"><li>• Cisco Certified Extensions, all versions through CCX4 and CCX Lite</li><li>• WAPI</li></ul>
<b>Sub-channels</b>	Multinational support with frequency bands and channels compliant to local regulations.
<b>Network Architecture Models</b>	Ad-hoc (Peer to Peer) Infrastructure (Access Point Required)
<b>Roaming</b>	IEEE 802.11 compliant roaming between band Access Points
<b>Output Power<sup>2</sup></b>	<ul style="list-style-type: none"><li>• 802.11b : +16dBm minimum</li><li>• 802.11g : +14dBm minimum</li><li>• 802.11a : +14dBm minimum</li><li>• 802.11n HT20(2.4GHz) : +13dBm minimum</li><li>• 802.11n HT40(2.4GHz) : +13dBm minimum</li><li>• 802.11n HT20(5GHz) : +12dBm minimum</li><li>• 802.11n HT40(5GHz) : +12dBm minimum</li></ul>
<b>Power Consumption</b>	Transmit: 2.0 W (max)  Receive: 1.6 W (max)  Idle mode (PSP): 180 mW (WLAN Associated)  Idle mode: 60 mW (WLAN unassociated)  Radio disabled: 30 mW
<b>Power Management</b>	ACPI and PCI Express compliant power management 802.11 compliant power saving mode
<b>Receiver Sensitivity<sup>3</sup></b>	802.11b, 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
<b>Antenna type</b>	High efficiency antenna with spatial diversity, mounted in the display enclosure  Two embedded dual band 2.4/5 GHz antennas are provided to the card to support WLAN MIMO and Bluetooth communications
<b>Form Factor</b>	PCI-Express M.2 MiniCard



## Technical Specifications

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

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

### HP Integrated Module with Bluetooth 4.0+EDR Wireless Technology

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



## Technical Specifications

with a maximum transmit power of +4 dBm for BR and EDR.

**Receiver Sensitivity**

<b>Modulation</b>	<b>0.01% BER</b>	<b>0.001% BER</b>
GFSK	-80 dBm	-70 dBm
$\pi/4$ -DQPSK	-80 dBm	-70 dBm
8DPSK	-80 dBm	-70 dBm

**Power Consumption**

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

**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

**Bluetooth Profiles Supported**

Serial Port Profile (SPP)<sup>1</sup>  
 Service Discovery Application Profile (SDAP)  
 Dial-Up Networking (DUN)<sup>1,2</sup>



### Technical Specifications

Generic Object Exchange Profile (GOEP)<sup>1,2</sup>  
Object Push Profile (OPP)<sup>1,2</sup>  
File Transfer Profile (FTP)  
Synchronization Profile (SYNC)  
Hard Copy Cable Replacement (HCRP)<sup>1,2</sup>  
Personal Area Networking Profile (PAN)<sup>1,2</sup>  
Human Interface Device Profile (HID)<sup>1,2</sup>  
FAX Profile (FAX)  
Basic Imaging Profile (BIP)<sup>2</sup>  
Headset Profile (HSP)  
Hands Free Profile (HFP)  
Advanced Audio Distribution Profile (A2DP)

**Bluetooth V4.1/V4.2 support feature**

V4.1: ESR5/6/7 compliant

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

**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



## Technical Specifications

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<sup>1</sup>

- 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 Models

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

### Roaming

IEEE 802.11 compliant roaming between band Access Points

### Output Power<sup>2</sup>

- 802.11b : +16dBm minimum
- 802.11g : +14dBm minimum
- 802.11a : +14dBm minimum



## Technical Specifications

<b>Power Consumption</b>	<ul style="list-style-type: none"> <li>• 802.11n HT20(2.4GHz) : +13dBm minimum</li> <li>• 802.11n HT40(2.4GHz) : +13dBm minimum</li> <li>• 802.11n HT20(5GHz) : +12dBm minimum</li> <li>• 802.11n HT40(5GHz) : +12dBm minimum</li> </ul> <p>Transmit: 2.0 W (max)</p> <p>Receive: 1.6 W (max)</p> <p>Idle mode (PSP): 180 mW (WLAN Associated)</p> <p>Idle mode: 60 mW (WLAN unassociated)</p> <p>Radio disabled: 30 mW</p>
<b>Power Management</b>	ACPI and PCI Express compliant power management 802.11 compliant power saving mode
<b>Receiver Sensitivity<sup>3</sup></b>	802.11b, 1Mbps : -94dBm maximum 802.11b, 11Mbps : -86dBm maximum 802.11g, 6Mbps : -88dBm maximum 802.11g, 54Mbps : -74dBm maximum 802.11a, 6Mbps : -86dBm maximum 802.11a, 54Mbps : -72dBm maximum 802.11n, MCS07 : -69dBm maximum 802.11n, MCS15 : -66dBm maximum
<b>Antenna type</b>	High efficiency antenna with spatial diversity, mounted in the display enclosure
	Two embedded dual band 2.4/5 GHz antennas are provided to the card to support WLAN MIMO and Bluetooth communications
<b>Form Factor</b>	PCI-Express M.2 MiniCard
<b>Dimensions</b>	Type 2230 : 2.3 x 22.0 x 30.0 mm
	Or
	Type 1630 : 2.3 x 16.0 x 30.0 mm
<b>Weight</b>	Type 2230 : 2.8g
	Or
	Type 1630 : 2g
<b>Operating Voltage</b>	3.3v +/- 9%
<b>Temperature</b>	Operating 14° to 158° F (-10° to 70° C)



### Technical Specifications

	Non-operating	-40° to 176° F (-40° to 80° C)
<b>Humidity</b>	Operating	10% to 90% (non-condensing)
	Non-operating	5% to 95% (non-condensing)
<b>Altitude</b>	Operating	0 to 10,000 ft (3,048 m)
	Non-operating	0 to 50,000 ft (15,240 m)
<b>LED Activity</b>	LED Amber - Radio OFF; LED White - Radio ON	

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

#### HP Integrated Module with Bluetooth 4.0+EDR Wireless Technology

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

#### Receiver Sensitivity

Modulation	0.01% BER	0.001% BER
GFSK	-80 dBm	-70 dBm
$\pi/4$ -DQPSK	-80 dBm	-70 dBm
8DPSK	-80 dBm	-70 dBm

#### Power Consumption

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



## Technical Specifications

<b>Range</b>	Up to 33 ft (10 m)
<b>Electrical Interface</b>	USB 2.0 compliant
<b>Bluetooth Software Supported</b>	Microsoft Windows Bluetooth Software
<b>Link Topology</b>	
<b>Electrical Interface</b>	Point to Point, Multipoint Pico Nets up to 7 slaves
<b>Bluetooth Software Supported</b>	Full support of Bluetooth Security Provisions
<b>Security</b>	
<b>Power Management</b>	Microsoft Windows ACPI, and USB Bus Support
<b>Power Management</b>	Self-configurable to optimize power conservation in all operating modes, including Standby, Hold, Park, and Sniff
<b>Certifications</b>	
<b>Security</b>	All necessary regulatory approvals for supported countries, including:
<b>Certifications</b>	FCC (47 CFR) Part 15C, Section 15.247 & 15.249
<b>Bluetooth Profiles Supported</b>	
<b>Power Management</b>	ETS 300 328, ETS 300 826
<b>Certifications</b>	Low Voltage Directive IEC950
	UL, CSA, and CE Mark
	Serial Port Profile (SPP) <sup>1</sup>
	Service Discovery Application Profile (SDAP)
	Dial-Up Networking (DUN) <sup>1,2</sup>
	Generic Object Exchange Profile (GOEP) <sup>1,2</sup>
<b>Certifications</b>	Object Push Profile (OPP) <sup>1,2</sup>
	File Transfer Profile (FTP)
<b>Bluetooth Profiles Supported</b>	Synchronization Profile (SYNC)
	Hard Copy Cable Replacement (HCRP) <sup>1,2</sup>
	Personal Area Networking Profile (PAN) <sup>1,2</sup>
	Human Interface Device Profile (HID) <sup>1,2</sup>
	FAX Profile (FAX)
	Basic Imaging Profile (BIP) <sup>2</sup>
	Headset Profile (HSP)
	Hands Free Profile (HFP)
	Advanced Audio Distribution Profile (A2DP)



## Technical Specifications

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

<b>Wireless LAN Standards</b>	IEEE 802.11b IEEE 802.11g  IEEE 802.11n
<b>Interoperability</b>	Wi-Fi certified
<b>Frequency Band</b>	802.11b/g/n <ul style="list-style-type: none"> <li>• 2.402 – 2.482 GHz</li> </ul> <p>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.</p>
<b>Data Rates</b>	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)
<b>Modulation</b>	Direct Sequence Spread Spectrum BPSK, QPSK, CCK, 16-QAM, 64-QAM,
<b>Security<sup>1</sup></b>	<ul style="list-style-type: none"> <li>• IEEE and WiFi compliant 64 / 128 bit WEP encryption for a/b/g mode only</li> <li>• AES-CCMP: 128 bit in hardware</li> <li>• 802.1x authentication</li> <li>• WPA, WPA2: 802.1x. WPA-PSK, WPA2-PSK, TKIP, and AES.</li> <li>• WPA2 certification</li> <li>• IEEE 802.11i</li> <li>• Cisco Certified Extensions, all versions through CCX4 and CCX Lite</li> <li>• WAPI</li> </ul>
<b>Network Architecture Models</b>	Ad-hoc (Peer to Peer) Infrastructure (Access Point Required)
<b>Roaming</b>	IEEE 802.11 compliant roaming between access points
<b>Output Power<sup>2</sup></b>	<ul style="list-style-type: none"> <li>• 802.11b : +16dBm minimum</li> <li>• 802.11g : +14dBm minimum</li> <li>• 802.11n HT20(2.4GHz) : +13dBm minimum</li> <li>• 802.11n HT40(2.4GHz) : +13dBm minimum</li> </ul>



### Technical Specifications

	<ul style="list-style-type: none"><li>• 802.11n HT20(5GHz) : +12dBm minimum</li><li>• 802.11n HT40(5GHz) : +12dBm minimum</li></ul>
<b>Power Consumption</b>	Transmit: 2.0 W (max) Receive: 1.6 W (max) Idle mode (PSP): 180 mW (WLAN Associated) Idle mode: 60 mW (WLAN unassociated)  Radio disabled: 30 mW
<b>Power Management</b>	ACPI and PCI Express compliant power management 802.11 compliant power saving mode
<b>Receiver Sensitivity<sup>3</sup></b>	802.11b, 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
<b>Antenna type</b>	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)
<b>Form Factor</b>	PCI-Express M.2 MiniCard
<b>Dimensions</b>	Type 2230 : 2.3 x 22.0 x 30.0 mm  Or Type 1630 : 2.3 x 16.0 x 30.0 mm
<b>Weight</b>	Type 2230 : 2.8g  Or Type 1630 : 2g
<b>Operating Voltage</b>	3.3v +/- 9%



### Technical Specifications

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

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

<b>Bluetooth Specification</b>	4.0+EDR Compliant													
<b>Frequency Band</b>	2402 to 2480 MHz													
<b>Number of Available Channels</b>	79 (1 MHz) available channels													
<b>Data Rates and Throughput</b>	3 Mbps data rate; throughput up to 2.17 Mbps													
	Synchronous Connection Oriented links up to 3, 64 kbps, voice channels													
	Asynchronous Connection Less links 2178.1 kbps/177.1 kbps asymmetric or 1306.9 kbps symmetric													
<b>Transmit Power</b>	The Bluetooth component shall operate as a Class II Bluetooth device with a maximum transmit power of +4 dBm for BR and EDR.													
<b>Receiver Sensitivity</b>	<table border="1"> <thead> <tr> <th>Modulation</th> <th>0.01% BER</th> <th>0.001% BER</th> </tr> </thead> <tbody> <tr> <td>GFSK</td> <td>-80 dBm</td> <td>-70 dBm</td> </tr> <tr> <td><math>\pi/4</math>-DQPSK</td> <td>-80 dBm</td> <td>-70 dBm</td> </tr> <tr> <td>8DPSK</td> <td>-80 dBm</td> <td>-70 dBm</td> </tr> </tbody> </table>		Modulation	0.01% BER	0.001% BER	GFSK	-80 dBm	-70 dBm	$\pi/4$ -DQPSK	-80 dBm	-70 dBm	8DPSK	-80 dBm	-70 dBm
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$\pi/4$ -DQPSK	-80 dBm	-70 dBm												
8DPSK	-80 dBm	-70 dBm												
<b>Power Consumption</b>	Peak (Tx) 330 mW Peak (Rx) 230 mW Selective Suspend 17 mW													



## Technical Specifications

<b>Range</b>	Up to 33 ft (10 m)
<b>Electrical Interface</b>	USB 2.0 compliant
<b>Bluetooth Software Supported</b>	Microsoft Windows Bluetooth Software
<b>Link Topology</b>	
<b>Electrical Interface</b>	Point to Point, Multipoint Pico Nets up to 7 slaves
<b>Bluetooth Software Supported</b>	Full support of Bluetooth Security Provisions
<b>Security</b>	
<b>Power Management</b>	Microsoft Windows ACPI, and USB Bus Support
<b>Power Management</b>	Self-configurable to optimize power conservation in all operating modes, including Standby, Hold, Park, and Sniff
<b>Certifications</b>	
<b>Security</b>	All necessary regulatory approvals for supported countries, including:
<b>Certifications</b>	FCC (47 CFR) Part 15C, Section 15.247 & 15.249
<b>Bluetooth Profiles Supported</b>	
<b>Power Management</b>	ETS 300 328, ETS 300 826
<b>Certifications</b>	Low Voltage Directive IEC950
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### Technical Specifications

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

<b>Wireless LAN Standards</b>	IEEE 802.11b IEEE 802.11g  IEEE 802.11n
<b>Interoperability</b>	Wi-Fi certified
<b>Frequency Band</b>	802.11b/g/n <ul style="list-style-type: none"><li>2.402 – 2.482 GHz</li></ul> 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.
<b>Data Rates</b>	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)
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### Technical Specifications

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<b>Receiver Sensitivity<sup>3</sup></b>	802.11b, 1Mbps : -94dBm maximum  802.11b, 11Mbps : -86dBm maximum  802.11g, 6Mbps : -88dBm maximum  802.11g, 54Mbps : -74dBm maximum  802.11n, MCS07 : -69dBm maximum  802.11n, MCS15 : -66dBm maximum
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	$\pi/4$ -DQPSK	-80 dBm	-70 dBm
	8DPSK	-80 dBm	-70 dBm

**Power Consumption**  
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Peak (Rx) 230 mW  
Selective Suspend 17 mW



## Technical Specifications

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## Technical Specifications

### **ENVIRONMENTAL**

**TBD**

### **COUNTRY OF ORIGIN**

China



## Technical Specifications

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



## Technical Specifications

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