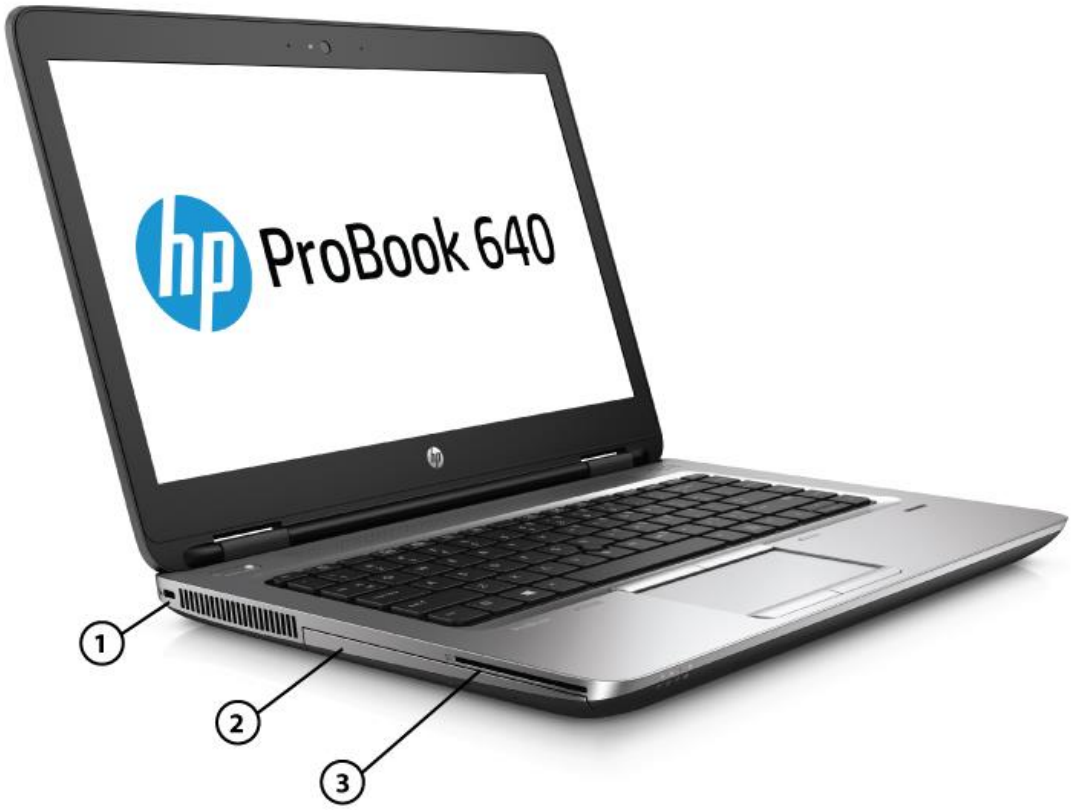
Overview

HP ProBook 640 G3 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. DisplayPort™
15. USB-C™ port
16. Microphone/ headphones combo jack
17. Fingerprint reader (select models)
18. Touchpad
19. Touchpad buttons
20. Indicator LEDs: Wireless Light, Power Light, AC Adapter/Battery Light, Storage Usage Light
21. NFC (select models)
22. Pointstick (select models)
23. Power button

Overview



Left side

1. Security lock slot
2. Optical drive (select models)
3. Smart Card Reader

Overview

Back

1. VGA port

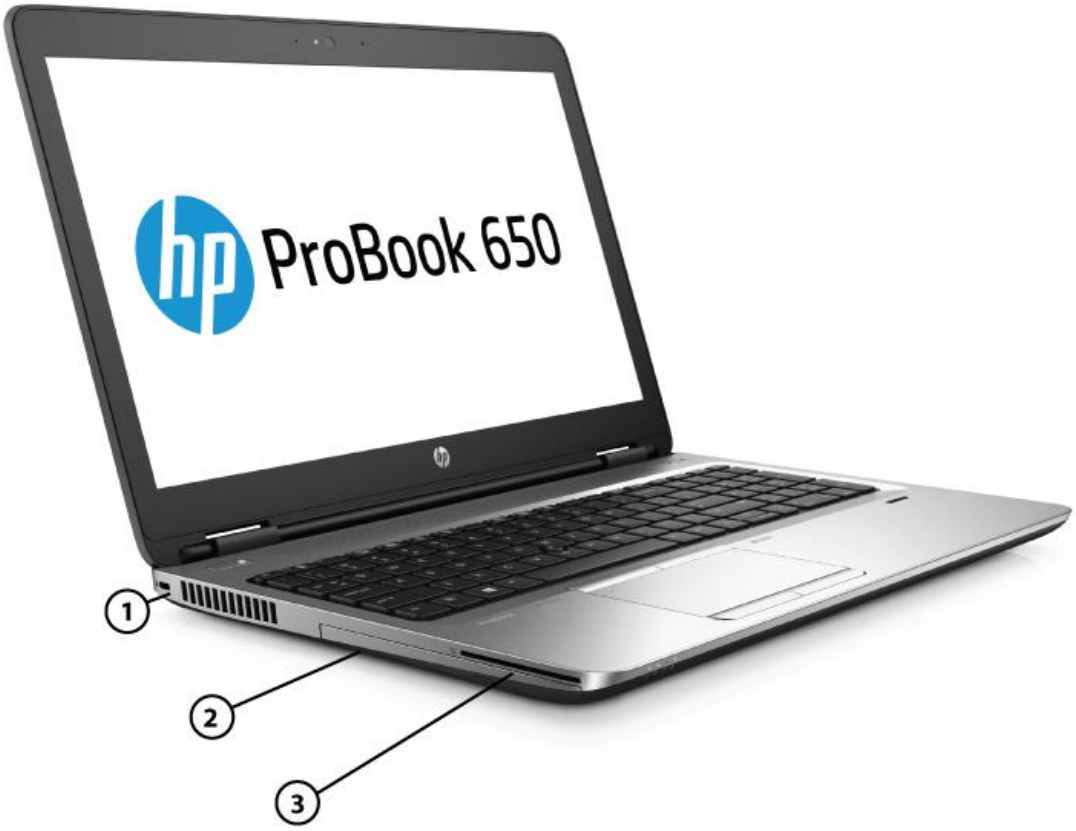
Overview

HP ProBook 650 G3 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. DisplayPort™
16. USB-C™ port
17. Microphone/ headphones combo jack
18. Fingerprint reader (select models)
19. Touchpad
20. Touchpad buttons
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 side

1. Security lock slot
2. Optical drive (select models)
3. Smart card reader

Overview

Back

1. VGA port
2. Serial port optional

Overview

AT A GLANCE

- Windows 10 versions, NeoKylin Linux® 64 or FreeDOS 2.0
- Protect existing IT investment with optional optical drive and optional serial port (HP ProBook 650 G3 only)
- Choice of 7th Generation Intel® Core™ i3, i5, and i7 processors (including quad core on HP ProBook 650 G3)
- 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 TPM 2.0, SmartCard Reader and optional Fingerprint reader
- LED-backlit display
  HP ProBook 640: 35.56 cm (14") diagonal HD and FHD or Touch FHD with camera and with WWAN
  HP ProBook 650: 39.6 cm (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 with integrated graphics
- Three USB ports for fast data transfer from devices: one standard, one charging, and one USB-C™ charging port
- 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
- Pending MIL STD testing

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.

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

Technical Specifications

PRODUCT NAMES

HP ProBook 640 G3 Notebook PC

HP ProBook 650 G3 Notebook PC

OPERATING SYSTEM

Preinstalled	Windows 10 Pro 64[1] Windows 10 Home 64[1] NeoKylin Linux 64 FreeDOS 2.0
Web-only Support	Windows 10 Enterprise 64[1]

NOTE: Your product does not support Windows 8 or Windows 7
In accordance with Microsoft's support policy, HP does not support the Windows® 8 or Windows 7 operating system on products configured with Intel and AMD 7th generation and forward processors or provide any Windows® 8 or Windows 7 drivers on http://www.support.hp.com.

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.windows.com.

PROCESSORS

Intel® Core™ i3-7100U (2.4 GHz, 3 MB cache, 2 cores)[1]
Intel® Core™ i5-7200U (2.5 GHz, up to 3.1 GHz with Intel Turbo Boost Technology, 3 MB cache, 2 cores)[1]
Intel® Core™ i5-7300U (2.6 GHz, up to 3.5 GHz with Intel Turbo Boost Technology, 3 MB cache, 2 cores)[1]
Intel® Core™ i5-7440HQ (2.8 GHz, up to 3.4 GHz with Intel Turbo Boost Technology, 6 MB cache, 4 cores)[1,2]
Intel® Core™ i7-7600U (2.9 GHz, up to 3.9 GHz with Intel Turbo Boost Technology, 4 MB cache, 2 cores)[1]
Intel® Core™ i7-7820HQ (2.9 GHz, up to 3.5 GHz with Intel Turbo Boost Technology, 8 MB cache, 4 cores)[1,2]

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. Available on HP ProBook 650 only.

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

CHIPSET

Integrated with processor

Technical Specifications

GRAPHICS

HP ProBook 640
Integrated:
Intel® HD[1] Graphics 620

Discrete:
AMD Radeon™ R7 M465 (2 GB GDDR5 dedicated memory)[2]

HP ProBook 650
Integrated:
Intel® HD[1] Graphics 620
Intel® HD[1] Graphics 630

Discrete:
AMD Radeon™ R7 M465X (2 GB GDDR5 dedicated memory) [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
35.56 cm (14") diagonal LED-backlit HD[1] SVA eDP Anti-glare Slim 45% CG 220 nits (1366x768)
35.56 cm (14") diagonal LED-backlit HD[1] SVA eDP Anti-glare Slim 45% CG 220 nits (1366x768) with camera
35.56 cm (14") diagonal LED-backlit HD[1] SVA eDP Anti-glare Slim 45% CG 220 nits (1366x768) with WWAN
35.56 cm (14") diagonal LED-backlit HD[1] SVA eDP Anti-glare Slim 45% CG 220 nits (1366x768) with camera and with WWAN
35.56 cm (14") diagonal LED-backlit FHD SVA eDP Anti-glare Slim 60% CG 300 nits (1920x1080)
35.56 cm (14") diagonal LED-backlit FHD SVA eDP Anti-glare Slim 60% CG 300 nits (1920x1080) with camera
35.56 cm (14") diagonal LED-backlit FHD SVA eDP Anti-glare Slim 60% CG 300 nits (1920x1080) with WWAN
35.56 cm (14") diagonal LED-backlit FHD SVA eDP Anti-glare Slim 60% CG 300 nits (1920x1080) with camera & WWAN
Touch
35.56 cm (14") diagonal LED-backlit FHD SVA eDP 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]

Technical Specifications

HP ProBook 650

Internal
Non-Touch
39.6 cm (15.6") diagonal LED-backlit HD[1] SVA eDP Anti-glare Slim 45% CG 220 nits (1366 x 768)
39.6 cm (15.6") diagonal LED-backlit HD[1] SVA eDP Anti-glare Slim 45% CG 220 nits (1366 x 768) with camera
39.6 cm (15.6") diagonal LED-backlit HD[1] SVA eDP Anti-glare Slim 45% CG 220 nits (1366 x 768) with WWAN
39.6 cm (15.6") diagonal LED-backlit HD[1] SVA eDP Anti-glare Slim 45% CG 220 nits (1366 x 768) with camera and with WWAN
39.6 cm (15.6") diagonal LED-backlit FHD SVA eDP Anti-glare Slim 60% CG 300 nits (1920 x 1080)
39.6 cm (15.6") diagonal LED-backlit FHD SVA eDP Anti-glare Slim 60% CG 300 nits (1920 x 1080) with camera
39.6 cm (15.6") diagonal LED-backlit FHD SVA eDP Anti-glare Slim 60% CG 300 nits (1920 x 1080) with WWAN
39.6 cm (15.6") diagonal LED-backlit FHD SVA eDP Anti-glare Slim 60% CG 300 nits (1920 x 1080) with camera & WWAN
Touch
39.6 cm (15.6") diagonal LED-backlit FHD SVA eDP 60% CG 300 nits (1920 x 1080) with camera with WWAN

External
Up to 32-bit per pixel color depth

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

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.

STORAGE AND DRIVES

Primary Storage Bay

SATA, 2.5" Hard Drives[1]
500 GB 7200 rpm
500 GB 7200 rpm Self-Encrypting Drive (Opal 2)
500 GB 7200 rpm Self Encrypting Drive (Opal 2) (FIPS-140-2)
1 TB 5400 rpm
500 GB 5400 rpm Hybrid

M.2 (NGFF) Solid State Drive[1]
128 GB SATA-3 SS Value
256 GB SATA-3 SS TLC (Opal 2)

256 GB PCIe Gen3x4 NVMe SS TLC
512 GB PCIe Gen3x4 NVMe SS TLC
512 GB SATA SS TLC (FIPS)
512 GB PCIe Gen3x4 NVMe SS TLC (Opal 2)

1. For storage drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 30 GB of system disk is reserved for system recovery software.

OPTICAL DRIVES

Fixed 9.5 mm SATA
DVD-ROM Drive
DVD+/-RW SuperMulti DL1

1. Intended for your original content and other lawful uses. Don't copy copyright-protected materials.
Note that DVD-RAM cannot read or write to 2.6GB Single Sided/5.2 GB Double Sided – Version 1.0 media.
2. Not available on with Touch panel.

MEMORY

DDR4-2133 SDRAM (Transfer rates up to 1866 MT/s)
Two SODIMM slots supporting dual-channel memory
Both slots are customer accessible / upgradeable

Configurations
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)
12288 MB Total System Memory (8192 MB + 4096 MB)
16384 MB Total System Memory (8192 MB x 2)

Maximum
Up to 16384 MB

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

Broadband Wireless (WWAN) [2,3]
HP lt4120 Qualcomm® Snapdragon™ X5 LTE Mobile Broadband Module
HP lt4132 LTE/HSPA+ 4G Mobile Broadband Module

Technical Specifications

HP hs3210 HSPA+ Mobile Broadband Module

Wireless LAN (WLAN)[1,2]
Options via Minicard
Intel® Dual Band Wireless-AC 3168 802.11 a/b/g/n/ac (1x1) Wi-Fi® and Bluetooth® 4.2 Combo (non-vPro)
Realtek 802.11b/g/n (1x1) and Bluetooth® 4.0 Combo (non-vPro)
Intel® Dual Band Wireless-AC 7265 802.11a/b/g/n/ac (2x2) WiFi and Bluetooth® 4.2 Combo (non-vPro)

Personal area network (WPAN Bluetooth) [1,2]
Bluetooth® 4.0 supported via Broadcom Realtek
Bluetooth® 4.2 supported via all supported Intel® WLAN modules

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

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 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.

Support for Miracast (Windows 10)
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.

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

Webcam
Optional 720p HD webcam [1,2]

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
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
BIOS Update via Network
Master Boot Record Security

Technical Specifications

Power On Authentication
Secure Erase[2]
Absolute Persistence Module[3]
Pre-boot Authentication

Multi Media

CyberLink Power Media Player - CMIT
CyberLink Power2Go

Communication / Connectivity

HP Mobile Connect Pro (Windows 10 only)[4]
Native Miracast Support[5]
HP LAN-WLAN Protection
HP MAC Address Manager

HP Value Add Software

HP 3D DriveGuard[10]
HP ePrint Driver[6]
HP Hotkey Support - CMIT
HP Recovery Manager
HP Jumpstart
HP Support Assistant
HP Noise Cancellation Software
HP Image Assistant
HP Workwise[12]

Microsoft Products

Buy Office
Bing Search
Skype[7]

Manageability

HP Driver Packs[8]
HP SoftPaq Download Manager (SDM)
HP System Software Manager (SSM)[8]
HP BIOS Config Utility (BCU)[8]
HP Client Catalog[8]
HP MIK for Microsoft SCCM[8]
LANDESK Management[9]
For more information on HP Client Management Solutions refer to: http://www.hp.com/go/clientmanagement.

Client Security Software

HP Client Security Suite Gen3

Technical Specifications

- 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 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.)[11]
HP Fingerprint reader (On select models)
Security lock slot (Cable not included)
Integrated Smart Card Reader

1 Available only on business PCs with HP BIOS.
2. For the methods outlined in the National Institute of Standards and Technology Special Publication 800-88.
3. Absolute agent is shipped turned off, and will be activated when customers activate a purchased subscription. Subscriptions can be purchased for terms ranging multiple years. Service is limited, check with Absolute for availability outside the U.S. The Absolute Recovery Guarantee is a limited warranty. Certain conditions apply. For full details visit: http://www.absolute.com/company/legal/agreements/ computrace-agreement. Data Delete is an optional service provided by Absolute Software. If utilized, the Recovery Guarantee is null and void. In order to use the Data Delete service, customers must first sign a Pre-Authorization Agreement and either obtain a PIN or purchase one or more RSA SecurID tokens from Absolute Software.
4. HP Mobile Connect Pro is only available on preconfigured devices with WWAN. For geographic availability refer to www.hp.com/go/mobileconnect
5. Miracast is a wireless technology your PC can use to project your screen to TVs, projectors, and streaming media players that also support Miracast. You can use Miracast to share what you're doing on your PC and present a slide show. For more information: http://windows.microsoft.com/en-us/windows-8/project-wireless-screen-miracast
6. Requires an Internet connection to HP web-enabled printer and HP ePrint account registration (for a list of eligible printers, supported documents and image types and other HP ePrint details, see www.hp.com/go/eprintcenter).
7. Skype is not offered in China.
8. Not preinstalled, however available for download at http://www.hp.com/go/clientmanagement
9. Subscription required.
10. Requires Windows.
11. This product ships with TPM 1.2 with option to upgrade to TPM 2.0. Upgrade utility is expected to be available via HP Customer Support.
12. HP Workwise smartphone app will soon be available as a free download on the App Store and Google Play.

POWER

Power Supply[1]
HP 45W Smart AC Adapter
HP 45W Smart AC Adapter (2 prong)
HP 65W Smart AC Adapter

Technical Specifications

HP 65W Smart EM Adapter
HP 90W Smart AC Adapter

1. Availability may vary by country.

Power cord
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)

NOTE: Battery is internal and not replaceable by customer.

Battery Life[1]
TBD

System Standby Time[2]
TBD

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. Standby life will vary depending on various factors including battery, Memory, CPU, EC and LAN chip. The maximum capacity of the battery will naturally decrease with time and usage.

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)

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 2.70 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
1 USB Type-C™

Technical Specifications

1 USB 3.0 port
1 USB 3.0 port charging
1 RJ-45 / Ethernet
1 Docking connector
1 Headphone / Microphone (Combo jack)
1 AC port (4.5mm)
1 DisplayPort™ 1.2
1 VGA port
1 Optional Serial port (Only available on HP ProBook 650) [1]

1. Sold separately or as an optional feature.

SD Media Reader Slot
Supports SD, SDHC, SDXC

SERVICE AND SUPPORT

HP Services offers 3-year and 1-year limited warranties and 90 day software support options 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. On-site service and extended coverage is also available withHP Care Pack Services, optional extended service contracts that go beyond the 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. [1,2]

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. HP services are governed by the applicable HP terms and conditions of service provided or indicated to Customer at the time of purchase. Customer may have additional statutory rights according to applicable local laws, and such rights are not in any way affected by the HP terms and conditions of service or the HP Limited Warranty provided with your HP Product. 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

DISPLAYS

Note: All specifications represent the typical specifications provided by HP's component manufacturers; actual performance may vary either higher or lower.

14.0" diagonal FHD AG WLED SVA 60%cg 300nits eDP Slim Touch	
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 + Hi FRC
Viewing Angle	SVA 45/45/25/35
Touch Enabled	Optional
Touch Point Supported	10-point multi-touch
Other Features	AS
Pen Enabled	No

14.0" diagonal HD AG WLED SVA 45%cg 220nits eDP Slim	
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	290 g max
Interface	eDP 1.2

Technical Specifications

Surface Treatment	Anti-Glare (AG)
Contrast Ratio	300:1 (typical)
Refresh Rate	60 Hz
Brightness	220 nits
Pixel Resolution - Format	112
PPI	1366 x 768 (HD)
Pixel Resolution - Configuration	RGB
Backlight	LED
Color Gamut Coverage	45%
Color Depth	6 bits + Hi FRC
Viewing Angle	SVA 45/45/25/35
Touch Enabled	Optional
Touch Point Supported	10-point multi-touch
Other Features	AS
Pen Enabled	No

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

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	142
PPI	1920 x 1080 (FHD)
Pixel Resolution - Configuration	RGB
Backlight	LED
Color Gamut Coverage	60%
Color Depth	6 bits
Viewing Angle	SVA 45/45/25/35
Touch Point Supported	Optional
Other Features	10-point multi-touch
Pen Enabled	AS

15.6" diagonal HD AG WLED SVA 45%cg 220nits eDP Slim

Active Area (W x H)	344.2 x 193.5 (mm)

Technical Specifications

Dimensions (W x H)	360 x 224.3 (mm) max
Diagonal Size	15.6 (inch)
Thickness	3.2 (mm) max
Weight	370 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	101
PPI	1366 x 768 (HD)
Pixel Resolution - Configuration	RGB
Backlight	LED
Color Gamut Coverage	45%
Color Depth	6 bits + Hi FRC
Viewing Angle	SVA 45/45/25/35

STORAGE

HDD 500 GB 7200RPM 7mm SATA		
Capacity		**500GB**
Drive Weight		0.20-0.21 lbs (92-95 g)
Rotation Speed		7200 rpm
Cache Buffer		Up to 32MB
NAND Type/Size		N/A
Height		7mm
Width		69.85mm
Interface		ATA-8, SATA 3.0
Interface Transfer Rate		600 MB/s
	Single Track	1.5-2 ms
Seek Time	**Average**	11-13 ms
	Maximum	18-22 ms
Logical Blocks		976,773,168
Operating Temperature		32° to 140° F (0° to 60° C) [top cover temp]
Security Features		ATA Security
Other Features		S.M.A.R.T., NCQ, Ultra DMA

HDD 500GB 7200RPM 7mm FIPS SATA Opal2		
Capacity		500 GB
Drive Weight		0.21 lbs (95 g)
Rotation Speed		7200 rpm
Cache Buffer		32 MB
NAND Type/Size		N/A
Height		0.28 in (7 mm)
Width		2.75 in (69.85 mm)
Interface		ATA-8, SATA 3.0
Interface Transfer Rate		600 MB/s
	Single Track	1.5 ms
Seek Time	**Average**	12 ms
	Maximum	21 ms
Logical Blocks		976,773,168
Operating Temperature		32° to 140° F (0° to 60° C) [top cover temp]
Security Features		ATA Security; TCG Opal 2.x, FIPS
Other Features		S.M.A.R.T., NCQ, Ultra DMA

HDD 500GB 7200RPM 7mm SED SATA Opal2		
Capacity		500 GB
Drive Weight		0.21 lbs (95 g)
Rotation Speed		7200 rpm
Cache Buffer		32 MB
NAND Type/Size		N/A
Height		0.28 in (7 mm)
Width		2.75 in (69.85 mm)
Interface		ATA-8, SATA 3.0
Interface Transfer Rate		600 MB/s
	Single Track	1.5 ms
Seek Time	**Average**	12 ms
	Maximum	21 ms
Logical Blocks		976,773,168

Technical Specifications

Operating Temperature	32° to 140° F (0° to 60° C) [top cover temp]
Security Features	ATA Security; TCG Opal 2.x
Other Features	S.M.A.R.T., NCQ, Ultra DMA

HDD 1TB 5400RPM 7mm SATA

Capacity		**1TB**
Drive Weight		0.198-0.21 lbs (90-95 g)
Rotation Speed		5400 rpm
Cache Buffer		Up to 32MB
NAND Type/Size		N/A
Height		7mm
Width		69.85mm
Interface		ATA-8, SATA 3.0
Interface Transfer Rate		600 MB/s
	Single Track	1.5-2 ms
Seek Time	**Average**	12-13 ms
	Maximum	18-32 ms
Logical Blocks		1,953,525,168
Operating Temperature		32° to 140° F (0° to 60° C) [top cover temp]
Security Features		ATA Security
Other Features		S.M.A.R.T., NCQ, Ultra DMA

HDD 500 GB 5400RPM 7mm Hybrid SATA 8GB NAND

Capacity		500 GB
Drive Weight		0.20-0.21 lbs (92-95 g)
Rotation Speed		5400 rpm
Cache Buffer		Up to 64MB
NAND Type/Size		MLC/8GB
Height		7mm
Width		69.85mm
Interface		ATA-8, SATA 3.0
Interface Transfer Rate		600 MB/s
	Single Track	2 ms
Seek Time	**Average**	12 ms
	Maximum	22 ms
Logical Blocks		976,773,168

Technical Specifications

Operating Temperature	32° to 140° F (0° to 60° C) [top cover temp]
Security Features	ATA Security
Other Features	S.M.A.R.T., NCQ, Ultra DMA

SSD 128GB 2280 M2 SATA-3 Value

Form-Factor (I/O)	M.2 2280
Capacity	128 GB
NAND Type	MLC/TLC
Weight	0.01-0.02 lb (6-10 g)
Height	0.09 in (2.3 mm)
Width	0.87 in (22 mm)
Interface	ATA-8, SATA 3.0
Sequential Read	Up to 535 MB/s
Sequential Write	Up to 515 MB/s
Logical Blocks	250,069,680
Operating Temperature	32° to 158°F (0° to 70°C) [ambient temp]
Security Features	ATA Security (Option)
Other Features	DIPM; TRIM; DEVSLP

SSD 256GB 2280 M2 PCIe-3x4 SS NVMe TLC

Form-Factor (I/O)	M.2 2280
Capacity	256 GB
NAND Type	TLC
Weight	0.02 lb (10 g)
Height	0.09 in (2.3 mm)
Width	0.87 in (22 mm)
Interface	PCIe NVMe Gen3X4
Sequential Read	Up to 2600 MB/s
Sequential Write	Up to 900 MB/s
Logical Blocks	500,118,192
Operating Temperature	32° to 158°F (0° to 70°C) [ambient temp]
Security Features	ATA Security (Option)
Other Features	TRIM; L1.2

SSD 512GB 2280 M2 PCIe-3x4 SS NVMe TLC

Technical Specifications

Form-Factor (I/O)	M.2 2280
Capacity	512 GB
NAND Type	TLC
Weight	0.02 lb (10 g)
Height	0.09 in (2.3 mm)
Width	0.87 in (22 mm)
Interface	PCIe NVMe Gen3X4
Sequential Read	Up to 2600 MB/s
Sequential Write	Up to 1400 MB/s
Logical Blocks	1,000,215,216
Operating Temperature	32° to 158°F (0° to 70°C) [ambient temp]
Security Features	ATA Security (Option)
Other Features	TRIM; L1.2

SSD 256GB 2280 M2 SATA-3 Self Encrypted OPAL2 Three Layer Cell

Form-Factor (I/O)	M.2 2280
Capacity	256 GB
NAND Type	TLC
Weight	0.02 lb (10 g)
Height	0.09 in (2.3 mm)
Width	0.87 in (22 mm)
Interface	ATA-8, SATA 3.0
Sequential Read	Up to 530 MB/s
Sequential Write	Up to 515 MB/s
Logical Blocks	500,118,192
Operating Temperature	32° to 158°F (0° to 70°C) [ambient temp]
Security Features	ATA Security; TCG Opal 2.0
Other Features	DIPM; TRIM; DEVSLP

OPTICAL DRIVES

DVDROM Drive	**Access Times**	**Random**	<140ms CD (typical) < 160ms DVD (typical)
	Weight	150g max.	
	Max Data Transfer Rate	24X CD-ROM 8X DVD-ROM 5X DVD-RAM	

			UDMA Mode 5
		Interface	Gen 1 SATA
		Supported Media (read)	CD-DA, CD-TEXT, CD-ROM, CD-ROM XA, MIXED MODE CD, CD-I, CD-I Bridge (Photo-CD, Video CD), Multisession CD (Photo-CD, CD-EXTRA, Portfolio, CD-R, CD-RW), CD-R, CD-RW, DVD-ROM (DVD-5, DVD-9, DVD-10, DVD-18), DVD-R, DVD-RW, DVD+R, DVD+RW, DVD-RAM
		Max Media Capacity (read)	8.5 GB
		Transport	Tray Loading
		Access Times	**Random** <140ms CD (typical) < 160ms DVD (typical)
		Weight	150g max.
		Max Data Transfer Rate	24X CD-ROM 8X DVD-ROM 24X CD-R 10X CD-RW 8X DVD+R 8X DVD+RW 8X DVD-R 6X DVD-RW 6X - DVD+R Dual Layer 6X - DVD-R Dual Layer 5X DVD-RAM
DVD+/-RW SuperMulti DL Drive		**Transfer Mode**	UDMA Mode 5
		Interface	Gen 1 SATA
		Supported Media (read)	CD-DA, CD-TEXT, CD-ROM, CD-ROM XA, MIXED MODE CD, CD-I, CD-I Bridge (Photo-CD, Video CD), Multisession CD (Photo-CD, CD-EXTRA, Portfolio, CD-R, CD-RW), CD-R, CD-RW, DVD-ROM (DVD-5, DVD-9, DVD-10, DVD-18), DVD-R, DVD-RW, DVD+R, DVD+RW, DVD-RAM
		Supported Media (write)	CD-R, CD-RW, DVD+R, DVD+RW, DVD-R, DVD-RW, DVD-RAM, DVD+R DL, DVD-R DL
		Max Media Capacity (read)	8.5 GB
		Max Media Capacity (write)	8.5 GB
		Transport	Tray Loading
BD Drive		**Access Times**	**Random** <200ms CD (typical)

Technical Specifications

	<200ms DVD (typical)
	<250ms BD (typical)
Weight	150g max.
Max Data Transfer Rate	24X CD-ROM
	8X DVD-ROM
	6X BD-ROM
	24X CD-R
	10X CD-RW
	8X DVD+R
	8X DVD+RW
	8X DVD-R
	6X DVD-RW
	6X - DVD+R Dual Layer
	6X - DVD-R Dual Layer
	5X DVD-RAM
	4X BD-R
	2X BD-RE
Transfer Mode	UDMA Mode 5
Interface	Gen 1 SATA
Supported Media (read)	CD-DA, CD-TEXT, CD-ROM, CD-ROM XA, MIXED MODE CD, CD-I, CD-I Bridge (Photo-CD, Video CD), Multisession CD (Photo-CD, CD-EXTRA, Portfolio, CD-R, CD-RW), CD-R, CD-RW, DVD-ROM (DVD-5, DVD-9, DVD-10, DVD-18), DVD-R, DVD-RW, DVD+R, DVD+RW, DVD-RAM, BD-ROM, BD-R, BD-RE
Supported Media (write)	CD-R, CD-RW, DVD+R, DVD+RW, DVD-R, DVD-RW, DVD-RAM, DVD+R DL, DVD-R DL, BD-R, BD-RE
Max Media Capacity (read)	128 GB
Max Media Capacity (write)	128 GB
Transport	Tray Loading

NETWORKING

	HP lt4120 Qualcomm® Snapdragon™ X5 LTE Mobile Broadband Module*
Technology/Operating bands	LTE: 2100 (Band 1), 1900 (Band 2), 1800 (Band 3), 1700/2100 (Band 4), 850 (Band 5), 2600 (Band 7), 900 (Band 8), 700 (Band 12 lower), 700 (Band 13 upper), 700 (Band 17 lower), 800 (Band 20), 700 (Band 28). HSPA+: 2100 (Band 1), 1900 (Band 2), 1700/2100 (Band 4), 850 (Band 5), 900 (Band 8) MHz EV-DO: 850 (BC0), 1900 (BC1) MHz (Only work with Verizon network) E-GPRS: 1900 (Band 2), 1800 (Band 3), 850 (Band 5), 900 (Band 8) MHz
Wireless protocol standards	3GPP Release 10 LTE Specification CAT.4, 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 al provider to determine the coverage area and availability. Connection speeds will vary due to location, environment, network conditions, ar not available on all products or in all countries.

HP lt4132 LTE/HSPA+ 4G Mobile Broadband Module

Technology/Operating bands	LTE: 2100 (Band 1), 1900 (Band 2), 1800 (Band 3) MHz,

	850 (Band 5), 2600 (Band 7), 900 (Band 8) MHz, 800 (Band 20), 700 (Band 28) MHz. HSPA+: 2100 (Band 1), 1900 (Band 2), 850 (Band 5), 900 (Band 8) MHz E-GPRS: 1900 (Band 2), 1800 (Band 3), 850 (Band 5), 900 (Band 8) MHz
Wireless protocol standards	3GPP Release 10 LTE Specification CAT.4, WCDMA R99, 3GPP Release 5, 6, 7 and 8 UMTS Specification E-GPRS: Class B, Multi-slot class 12, coding schemes CS1 - CS4 and MSC1 - MSC9
GPS	Standalone, A-GPS (MS-B and LTO)
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) 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 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) E-GPRS: 2,600 mA (peak); 500 mA (average)
Form Factor	M.2, 3042-S3 Key B

Technical Specifications

Weight	6 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 conditions, a not available on all products or in all countries.

	HP hs3210 HSPA+ Mobile Broadband Module*
Technology/Operating bands	HSPA+: 2100 (Band1), 1900 (Band 2), 850 (Band 5), 900 (Band 8) MHz E-GPRS: 1900 (Band 2), 1800 (Band 3), 850 MHz (Band 5), 900 (Band 8) MHz
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
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, 2242-S3 Key B
Weight	6 g
Dimensions (Length x Width x Thickness)	1.65 x 8.66 x 0.09 in (42 x 22 x 2.38 mm)

Technical Specifications

* 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® Dual Band Wireless-AC 3168 802.11 a/b/g/n/ac (1x1) Wi-Fi® and Bluetooth® 4.2 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. 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 only supports 5.725 - 5.825 GHz (CH149 - CH161)
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) (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
- 802.11ac 80MHz(5GHz) : +11dBm minimum

Power Consumption

Transmit: 2.0 W (max)

Receive: 1.6 W (max)

Idle mode (PSP): 180 mW (WLAN Associated)

Idle mode: 50 mW (WLAN unassociated)

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	
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
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)

Technical Specifications

	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 **Bluetooth Profiles Supported**	Serial Port Profile (SPP)[1.2] Service Discovery Application Profile (SDAP) Dial-Up Networking (DUN)[1.1] 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)[1.0] Human Interface Device Profile (HID)[1.0] Hands Free Profile (HFP) [1.5/1.6] Advanced Audio Distribution Profile (A2DP) [1.3] Audio Video Remote Control Profile (AVRCP) [1.3/1.4]

Bluetooth V4.1/V4.2 support feature	V4.1: ESR5/6/7 compliant V4.2: ESR8 compliant, LE Secure Connection – Basic.

Realtek 802.11b/g/n (1x1) and Bluetooth® 4.0 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. 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 only supports 5.725 - 5.825 GHz (CH149 - CH161)
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) (20MHz, 40MHz, and 80MHz)

Technical Specifications

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 • 802.11ac 80MHz(5GHz) : +11dBm minimum
Power Consumption	Transmit: 2.0 W (max) Receive: 1.6 W (max) Idle mode (PSP): 180 mW (WLAN Associated) Idle mode: 50 mW (WLAN unassociated) 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	
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 4.0/4.1/4.2 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
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

Technical Specifications

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 **Bluetooth Profiles Supported**	Serial Port Profile (SPP)[1.2] Service Discovery Application Profile (SDAP) Dial-Up Networking (DUN)[1.1] 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)[1.0] Human Interface Device Profile (HID)[1.0] Hands Free Profile (HFP) [1.5/1.6] Advanced Audio Distribution Profile (A2DP) [1.3] Audio Video Remote Control Profile (AVRCP) [1.3/1.4]
Bluetooth V4.1/V4.2 support feature	V4.1: ESR5/6/7 compliant
	V4.2: ESR8 compliant, LE Secure Connection – Basic.

Intel® Dual Band Wireless-AC 7265 802.11a/b/g/n/ac (2x2) WiFi and Bluetooth® 4.2 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. 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) 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	
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 4.0/4.1/4.2 Wireless Technology

Technical Specifications

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
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

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 **Bluetooth Profiles Supported**	Serial Port Profile (SPP)[1.2] Service Discovery Application Profile (SDAP) Dial-Up Networking (DUN)[1,1] 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)[1.0] Human Interface Device Profile (HID)[1.0] Hands Free Profile (HFP) [1.5/1.6] Advanced Audio Distribution Profile (A2DP) [1.3] Audio Video Remote Control Profile (AVRCP) [1.3/1.4]
Bluetooth V4.1/V4.2 support feature	V4.1: ESR5/6/7 compliant
	V4.2: ESR8 compliant, LE Secure Connection – Basic.

Technical Specifications

POWER

45 W AC Adaptor		
Dimensions		95.0x40.0x26.5mm
Weight		unit: 200g +/- 10g
Input	**Input Efficiency**	87.74 % at 115 Vac and 88.4 % at 230Vac
	Input Frequency Range	47 ~ 63 Hz
	Input AC current	Max. 1.4 A at 90 Vac
Output	**Output Power**	45W
	DC Output	19.5V
	Hold-up Time	5ms at 115 Vac input
	Output Over Current Protection	<8.0A
DC Plug		4.5mm Barrel Type
Environmental Design	**Operating Temperature**	32ºF to 95ºF (0ºto 35ºC)
	Non-operating (storage) Temperature	-4ºF to 185ºF (-20ºto 85ºC)
	Altitude	0 to 16,400 ft (0 to 5000m)
	Humidity	20% to 95%
	Storage Humidity	10% to 95%
EMI and Safety Certifications		*CE Mark - full compliance with LVD and EMC directives * Worldwide safety standards - IEC60950, EN60950, UL60950, Class1, SELV; Agency approvals - C-UL-US, NORDICS, DENAN, EN55022 Class B, FCC Class B, CISPR22 Class B, CCC, NOM-1 NYCE. * MTBF - over 200,000 hours at 25°C ambient condition.

45 W 2 Prong AC Adaptor		
Dimensions		95.0x40.0x26.5mm
Weight		unit: 200g +/- 10g
Input	**Input Efficiency**	87.74 % at 115 Vac and 88.4 % at 230Vac
	Input Frequency Range	47 ~ 63 Hz
	Input AC current	Max. 1.4 A at 90 Vac
Output	**Output Power**	45W
	DC Output	19.5V
	Hold-up Time	5ms at 115 Vac input
	Output Over Current Protection	<8.0A
DC Plug		4.5mm Barrel Type
Environmental Design	**Operating Temperature**	32ºF to 95ºF (0ºto 35ºC)

	Non-operating (storage) Temperature	-4ºF to 185ºF (-20ºto 85ºC)
	Altitude	0 to 16,400 ft (0 to 5000m)
	Humidity	20% to 95%
	Storage Humidity	10% to 95%
EMI and Safety Certifications		*CE Mark - full compliance with LVD and EMC directives * Worldwide safety standards - IEC60950, EN60950, UL60950, Class2, SELV; Agency approvals - C-UL-US, PSE * MTBF - over 200,000 hours at 25°C ambient condition.
65 W AC Adaptor		
Dimensions		107.0x47.0x30.0mm
Weight		unit: 250g +/- 10g
Input	**Input Efficiency**	88.0 % at 115 Vac and 89.0 % at 230Vac
	Input Frequency Range	47 ~ 63 Hz
	Input AC current	Max. 1.7 A at 90 Vac
Output	**Output Power**	65W
	DC Output	19.5V
	Hold-up Time	5ms at 115 Vac input
	Output Over Current Protection	<11.0A
DC Plug		4.5mm Barrel Type
Environmental Design	**Operating Temperature**	32ºF to 95ºF (0ºto 35ºC)
	Non-operating (storage) Temperature	-4ºF to 185ºF (-20ºto 85ºC)
	Altitude	0 to 16,400 ft (0 to 5000m)
	Humidity	20% to 95%
	Storage Humidity	10% to 95%
EMI and Safety Certifications		*CE Mark - full compliance with LVD and EMC directives * Worldwide safety standards - IEC60950, EN60950, UL60950, Class1, SELV; Agency approvals - C-UL-US, NORDICS, DENAN, EN55022 Class B, FCC Class B, CISPR22 Class B, CCC, NOM-1 NYCE. * MTBF - over 200,000 hours at 25°C ambient condition.
65 W EM AC Adaptor		
Dimensions		102.0x55.0x30.0mm

Technical Specifications

Weight		unit: 350g +/- 10g
Input	**Input Efficiency**	87.0 % at 115 Vac and 230Vac
	Input Frequency Range	47 ~ 63 Hz
	Input AC current	Max. 1.7 A at 90 Vac
Output	**Output Power**	65W
	DC Output	19.5V
	Hold-up Time	5ms at 115 Vac input
	Output Over Current Protection	<11.0A
DC Plug		4.5mm Barrel Type
Environmental Design	**Operating Temperature**	32ºF to 95ºF (0ºto 35ºC)
	Non-operating (storage) Temperature	-4ºF to 185ºF (-20ºto 85ºC)
	Altitude	0 to 16,400 ft (0 to 5000m)
	Humidity	20% to 95%
	Storage Humidity	10% to 95%
EMI and Safety Certifications		*CE Mark - full compliance with LVD and EMC directives * Worldwide safety standards - IEC60950, EN60950, UL60950, Class1, SELV; Agency approvals - C-UL-US, NORDICS, DENAN, EN55022 Class B, FCC Class B, CISPR22 Class B, CCC, NOM-1 NYCE. * MTBF - over 200,000 hours at 25°C ambient condition.

90 W AC Adaptor		
Dimensions		127.0x51.0x30.0mm
Weight		unit: 350g +/- 10g
Input	**Input Efficiency**	88% min at 115V and 89% min at 230V
	Input Frequency Range	47 ~ 63 Hz
	Input AC current	1.5 A at 90 VAC and maximum load
Output	**Output Power**	90W
	DC Output	19.5V
	Hold-up Time	5ms at 115 Vac input
	Output Over Current Protection	<11.0A
DC Plug		4.5mm Barrel Type
Environmental Design	**Operating Temperature**	32ºFto 95ºF (0ºto 35ºC)
	Non-operating (storage) Temperature	-4ºFto 185ºF (-20ºto 85ºC)
	Altitude	0 to 16,400 ft (0 to 5000m)
	Humidity	5% to 95%

Technical Specifications

	Storage Humidity		5% to 95%
EMI and Safety Certifications			*CE Mark - full compliance with LVD and EMC directives * Worldwide safety standards - IEC60950, EN60950, UL60950, Class1, SELV; Agency approvals - C-UL-US, NORDICS, DENAN, EN55022 Class B, FCC Class B, CISPR22 Class B, CCC, NOM-1 NYCE. * MTBF - over 100,000 hours at 25°C ambient condition.
HP 3-cell, Long Life 48 WHr Li-ion	**Dimensions** (H x W x L)		15.05. x177.55x94.55 mm
	Weight		0.25 kg (0.55lb)
	Cells/Type		3cell Lithium-Ion
	Energy	Voltage	11.4V/ 10.95V
		Amp-hour capacity	4.212Ah /4.385Ah
		Watt-hour capacity	48Wh
	Temperature	Operating (Charging)	32˚ to 113˚ F (0˚ to 45˚ C)
		Operating (Discharging)	14˚ to 122˚ F(-10˚ to 60˚ C)
		Non-operating	-4˚ to 122˚ F (-20˚ to 60˚ C)
	Battery Re-Charge Time	**System in OFF or Standby Mode**	<3 hours
	Fuel Gauge LED		No
	Warranty		3 year
	Optional Travel Battery Available		No

SECURITY

HP Fingerprint Reader (optional)	**Mobile Voltage Operation**	3.0V-3.6V
	Operating Temperature	14° – 167°F (-10° – 75°C)
	Current consumption	Imaging: 36 mA (typical) Low latency wakeup: 950 µA (typical) USB Suspend: 220 µA (max)
	ESD Resistance	IEC 61000-4-2 Level 4B (±15KV)
	Detection Matrix	508 DPI resolution, 256 levels of grayscale 200 pixel wide fingerprint image (10mm) 16.5mm x 3 mm (sensor area)

Smart Card Reader

Smart card standard	PC/SC 2.0 for Windows smart card standard	
Dimensions (L x W x H)	0.41x 0.08 x 0.32 in (10.5 x 2 x 8.2 mm)	
Smart Card support	ISO 7816 Class A, B, and C (5V/3V/1.8V) card	
Smart Card Interface	Smart Card Interface with T = 0 and T = 1 support Support I2C memory card, SLE4418, SLE4428, SLE4432, SLE4442, SLE4436, SLE5536, SLE6636, AT88SC1608, AT45D041 card and AT45DB041 card via external EEPROM	
Operating systems	No driver is required for this device. Native support is provided by the operating system.	
Power	**Normal Mode**	With card present, before being suspended: 40.9 mA Without card present, before being suspended: 33.16 mA After being suspended with smart card present: 380 µA After being suspended without smart card present: 380 µA
	Power Saving Mode	With card present, before being suspended: 40.6 mA Without card present: 380 µA After being suspended with smart card present: 380 µA

Features

- Support single slot
- Support T0, T1 protocol
- Support I2C memory card, SLE4418, SLE4428, SLE4432, SLE4442, SLE4436,
- SLE5536, SLE6636, AT88SC1608, AT45D041 card and AT45DB041 card via external EEPROM
- Support ISO7816 Class A, B and C (5V/3V/1.8V) card
- Implemented as an USB full speed device with bulk transfer endpoint, Mass
- Storage endpoint
- Built-in PLL for USB and Smart Card clocks requirement
- Support EEPROM for USB descriptors customization (PID/VID/ iManufacturer/iProduct/Serial Number), Direct Web Page Link, and accessing memory card module.
- EEPROM programmable via USB interface
- Support software update for memory card module
- Support Direct Web Page Link via configuration in external EEPROM
- Support short APDU and extended APDU
- Compatible with Microsoft USB-CCID driver
- Support remote wake up through inserting card/removing card
- Support USB selective suspend
- Support Power Saving Mode (Using one pin to select between Normal/PWR Saving Mode)
- Support card power over current protection mechanism

- Built in resonator.
- Support USB LPM (Link Power Management) features.
- Embedded clock source.

ENVIRONMENTAL

HP ProBook 640 G3 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 • US ENERGY STAR® • EPEAT <Gold> registered in the United States. See http://www.epeat.net for registration status in your country.		
System Configuration **Energy Consumption (in accordance with US ENERGY STAR® test method)**	The configuration used for the Energy Consumption and Declared Noise Emissions data for the Notebook model is based on a "Typically Configured Notebook". **115VAC, 60Hz**	**230VAC, 50Hz**	**100VAC, 50Hz**
Normal Operation (Short idle)	5.53 W	5.95 W	5.53 W
Normal Operation (Long idle)	3.47 W	3.71 W	3.56 W
Sleep	0.53 W	0.58 W	0.53 W
Off	0.36 W	0.41 W	0.36 W
	Note: Energy efficiency data listed is for an ENERGY STAR® compliant product if offered within the model family. HP computers marked with the ENERGY STAR® Logo are compliant with the applicable U.S. Environmental Protection Agency (EPA) ENERGY STAR® specifications for computers. If a model family does not offer ENERGY STAR® compliant configurations, then energy efficiency data listed is for a typically configured PC featuring a hard disk drive, a high efficiency power supply, and a Microsoft Windows® operating system.		

Technical Specifications

Heat Dissipation*	**115VAC, 60Hz**	**230VAC, 50Hz**	**100VAC, 50Hz**
Normal Operation (Short idle)	19 BTU/hr	20 BTU/hr	19 BTU/hr
Normal Operation (Long idle)	12 BTU/hr	13 BTU/hr	12 BTU/hr
Sleep	2 BTU/hr	2 BTU/hr	2 BTU/hr
Off	1 BTU/hr	1 BTU/hr	1 BTU/hr
	*NOTE: Heat dissipation is calculated based on the measured watts, assuming the service level is attained for one hour.		

Declared Noise Emissions (in accordance with ISO 7779 and ISO 9296)	Sound Power (L_{WAd}, bels)	Sound Pressure (L_{pAm}, decibels)
Typically Configured – Idle	2.8	18
Fixed Disk – Random writes	2.8	19

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

<table>
<tr><td>Additional Information</td><td colspan="3">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 94.6% recycle-able when properly disposed of at end of life.</td></tr>
<tr><td rowspan="5">Packaging Materials</td><td>External:</td><td>PAPER/Corrugated</td><td>326 g</td></tr>
<tr><td>Internal:</td><td>PLASTIC/Polyethylene Expanded - EPE</td><td>42 g</td></tr>
<tr><td></td><td>PLASTIC/Polyethylene low density - LDPE</td><td>15 g</td></tr>
<tr><td></td><td>PLASTIC/Polypropylene - PP</td><td>4 g</td></tr>
<tr><td colspan="3">The plastic packaging material contains at least 50% recycled content.</td></tr>
<tr><td colspan="4">The corrugated paper packaging materials contains at least 70% recycled content.</td></tr>
<tr><td>Material Usage</td><td colspan="3">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)</td></tr>
</table>

Technical Specifications

Packaging Usage	HP follows these guidelines to decrease the environmental impact of product packaging: • Eliminate the use of heavy metals such as lead, chromium, mercury and cadmium in packaging materials. • Eliminate the use of ozone-depleting substances (ODS) in packaging materials. • Design packaging materials for ease of disassembly. • Maximize the use of post-consumer recycled content materials in packaging materials. • Use readily recyclable packaging materials such as paper and corrugated materials. • Reduce size and weight of packages to improve transportation fuel efficiency. • Plastic packaging materials are marked according to ISO 11469 and DIN 6120 standards.
End-of-life Management and Recycling	Hewlett-Packard offers end-of-life HP product return and recycling programs in many geographic areas. To recycle your product, please go to: http://www.hp.com/go/reuse-recycle or contact your nearest HP sales office. Products returned to HP will be recycled, recovered or disposed of in a responsible manner. The EU WEEE directive (2002/95/EC) requires manufacturers to provide treatment information for each product type for use by treatment facilities. This information (product disassembly instructions) is posted on the Hewlett Packard web site at: http://www.hp.com/go/recyclers. These instructions may be used by recyclers and other WEEE treatment facilities as well as HP OEM customers who integrate and re-sell HP equipment.
HP, Inc. Corporate Environmental Information	For more information about HP's commitment to the environment: Global Citizenship Report http://www.hp.com/hpinfo/globalcitizenship/gcreport/index.html Eco-label certifications http://www8.hp.com/us/en/hp-information/environment/ecolabels.html ISO 14001 certificates: http://h20195.www2.hp.com/V2/GetDocument.aspx?docname=c04755842 and http://www.hp.com/hpinfo/globalcitizenship/environment/pdf/cert.pdf

HP ProBook 650 G3 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 • US ENERGY STAR® • EPEAT® Gold registered in the United States. See http://www.epeat.net for registration status in your country.		
System Configuration **Energy Consumption (in accordance with US ENERGY STAR® test method)**	The configuration used for the Energy Consumption and Declared Noise Emissions data for the Notebook model is based on a "Typically Configured Notebook". **115VAC, 60Hz**	**230VAC, 50Hz**	**100VAC, 50Hz**
Normal Operation (Short idle)	6.29 W	6.66 W	6.42 W
Normal Operation (Long idle)	3.92 W	4.36 W	4.12 W
Sleep	0.43 W	0.48 W	0.43 W
Off	0.23 W	0.28 W	0.23 W
	Note: Energy efficiency data listed is for an ENERGY STAR® compliant product if offered within the model family. HP computers marked with the ENERGY STAR® Logo are compliant with the applicable U.S. Environmental Protection Agency (EPA) ENERGY STAR® specifications for computers. If a model family does not offer ENERGY STAR® compliant configurations, then energy efficiency data listed is for a typically configured PC featuring a hard disk drive, a high efficiency power supply, and a Microsoft Windows® operating system.		
Heat Dissipation*	**115VAC, 60Hz**	**230VAC, 50Hz**	**100VAC, 50Hz**
Normal Operation (Short idle)	22 BTU/hr	23 BTU/hr	22 BTU/hr

Technical Specifications

Normal Operation (Long idle)	13 BTU/hr	15 BTU/hr	14 BTU/hr
Sleep	1 BTU/hr	2 BTU/hr	1 BTU/hr
Off	1 BTU/hr	1 BTU/hr	1 BTU/hr
	*NOTE: Heat dissipation is calculated based on the measured watts, assuming the service level is attained for one hour.		

Declared Noise Emissions (in accordance with ISO 7779 and ISO 9296)	Sound Power (L_{WAd}, bels)	Sound Pressure (L_{pAm}, decibels)
Typically Configured – Idle	3.1	24
Fixed Disk – Random writes	3.3	26

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 8.5% post-consumer recycled plastic (by wt.) • This product is 94.9% recycle-able when properly disposed of at end of life.

Packaging Materials	**External:**	PAPER/Corrugated	329 g
	Internal:	PLASTIC/Expanded Polyethylene - EPE	41 g
		PLASTIC/Polyethylene low density - LDPE	13 g

Technical Specifications

		PLASTIC/Polypropylene - PP	5 g
	The plastic packaging material contains at least 50% recycled content.		
	The corrugated paper packaging materials contains at least 70% recycled content.		
Material Usage	This product does not contain any of the following substances in excess of regulatory limits (refer to the HP General Specification for the Environment at http://www.hp.com/hpinfo/globalcitizenship/environment/pdf/gse.pdf): • Asbestos • Certain Azo Colorants • Certain Brominated Flame Retardants – may not be used as flame retardants in plastics • Cadmium • Chlorinated Hydrocarbons • Chlorinated Paraffins • Formaldehyde • Halogenated Diphenyl Methanes • Lead carbonates and sulfates • 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.		

Technical Specifications

End-of-life Management and Recycling	Hewlett-Packard offers end-of-life HP product return and recycling programs in many geographic areas. To recycle your product, please go to: http://www.hp.com/go/reuse-recycle or contact your nearest HP sales office. Products returned to HP will be recycled, recovered or disposed of in a responsible manner. The EU WEEE directive (2002/95/EC) requires manufacturers to provide treatment information for each product type for use by treatment facilities. This information (product disassembly instructions) is posted on the Hewlett Packard web site at: http://www.hp.com/go/recyclers. These instructions may be used by recyclers and other WEEE treatment facilities as well as HP OEM customers who integrate and re-sell HP equipment.
HP, Inc. Corporate Environmental Information	For more information about HP's commitment to the environment: Global Citizenship Report http://www.hp.com/hpinfo/globalcitizenship/gcreport/index.html Eco-label certifications http://www8.hp.com/us/en/hp-information/environment/ecolabels.html ISO 14001 certificates: http://h20195.www2.hp.com/V2/GetDocument.aspx?docname=c04755842 and http://www.hp.com/hpinfo/globalcitizenship/environment/pdf/cert.pdf

COUNTRY OF ORIGIN

TBD

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

Category	Description	Part Number
Cases	HP Business Backpack	H5M90AA
	HP Business 4 Wheel Roller Case	H5M93AA
Docking	HP 3001pr USB 3.0 Port Replicator	F3S42AA
	HP USB-C Travel Dock	T0K29AA#ABA
	HP USB Travel Dock	T0K30AA#ABA
	HP Ultraslim Docking Station	D9Y32AA#xxx
Input Device	HP Comfort Grip Wireless Mouse	H2L63AA
	HP 3-Button USB Laser Mouse	H4B81AA
	HP Ultra Mobile Wireless Mouse	H6F25AA#xxx
	HP Slim Bluetooth Mouse	F3J92AA#xxx
	HP Ultrathin Wireless Mouse	L9V78AA
	HP Stereo USB Headset	T1A67AA
Adapters	DisplayPort to HDMI Adapter	F3W43AA
	DisplayPort to DVI Adapter	F7W96AA
Power	HP 45W Smart AC Adapter (4.5mm)	H6Y88AA#xxx
	45W 2 Prong Power Adapter, 4.5mm	L6F60AA#ABJ
	HP 65W Smart AC Adapter	H6Y89AA#xxx
	HP Notebook Power Bank	N9F71AA
	HP USB External DVDRW Drive	F2B56AA
Security	HP Keyed Cable Lock 10mm	T1A62AA
	HP Docking Station Cable Lock	AU656AA#XXX
Monitors	HP ProDisplay P240va 23.8-inch Monitor	N3H14AA
	HP ProDisplay P232 23-inch Monitor	K7X31AA

Sumary of changes

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