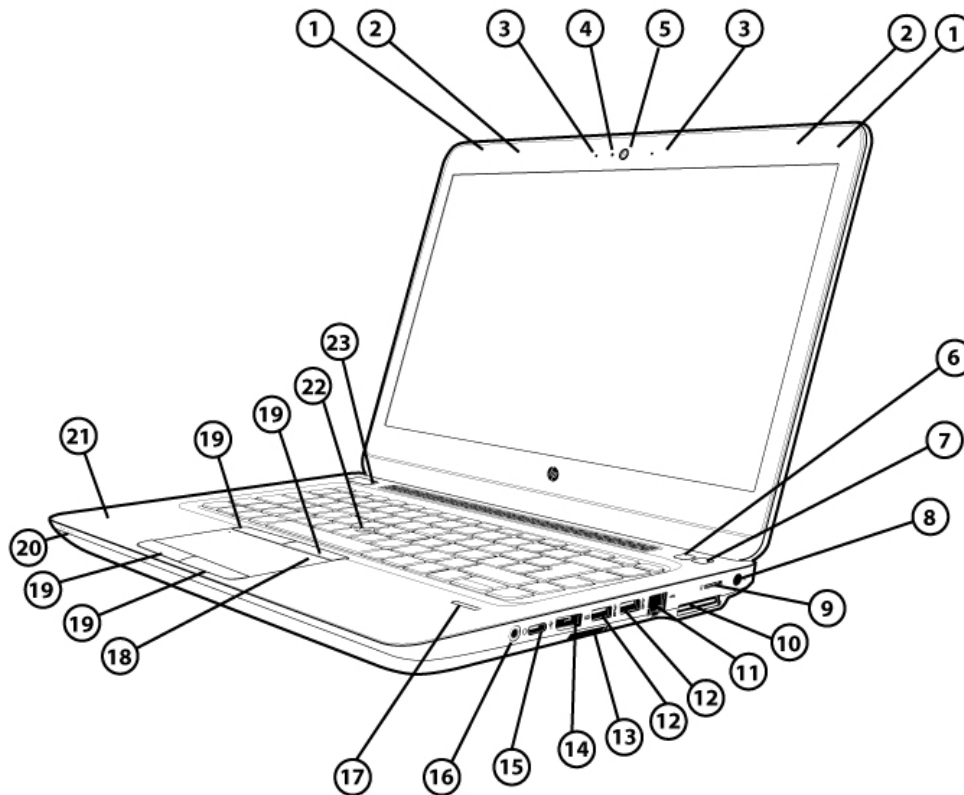


Overview

HP ProBook 645 G2 Notebook PC



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)

Front/Right

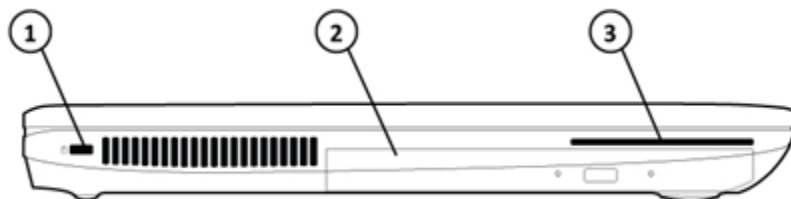
13. SD card slot
14. Display port
15. USB-C port
16. Microphone/ headphones combo jack
17. Fingerprint reader (select models)
18. Touchpad
19. Touchpad buttons (4)
20. Indicator LEDs: Wireless Light, Power Light, AC Adapter/Battery Light, Storage Usage Light
21. NFC (select models)
22. Pointstick
23. Power button

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

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



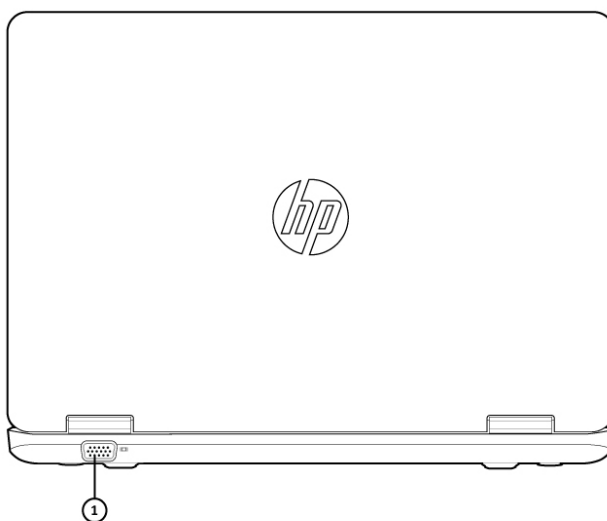
Overview



Left

- 1. Security lock slot
- 2. Optical drive

- 3. Smart card reader



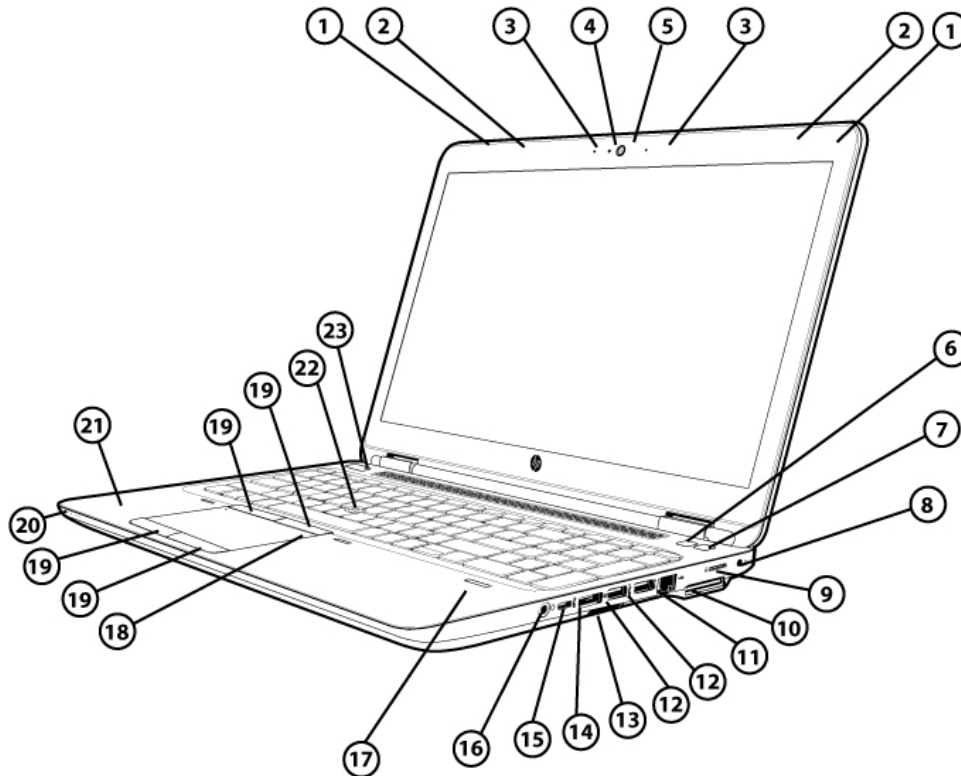
Back

- 1. VGA port



Overview

HP ProBook 655 G2 Notebook PC



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)

Front/Right

13. SD card slot
14. Display Port
15. USB-C port
16. Microphone/ headphones combo jack
17. Fingerprint reader (select models)
18. Touchpad
19. Touchpad buttons (4)
20. Indicator LEDs: Wireless Light, Power Light, AC Adapter/Battery Light, Storage Usage Light
21. NFC (select models)
22. Pointstick
23. Power button

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

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

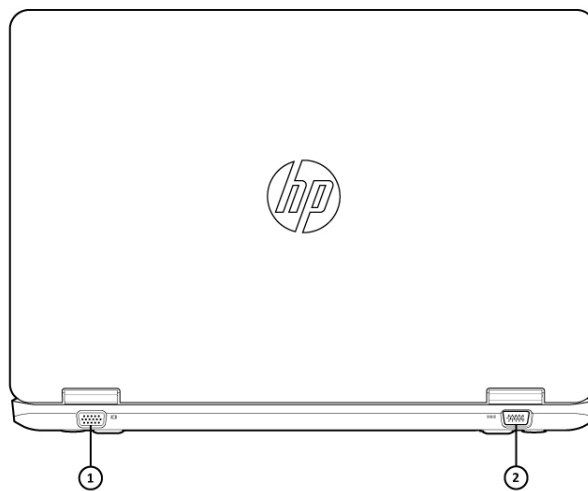


Overview



Left

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



Back

- 1. VGA port
- 2. Serial port optional (655 only)



Overview

AT A GLANCE

- Windows 10 versions, Windows 8.1 versions, Windows 7 versions, Ubuntu Linux , Ubuntu Kylin Linux or FreeDOS 2.0
- Thin and light design— PC-ABS (Polycarbonate–Acrylnitrile/Butadiene/Styrene) durable material is nearly 20% thinner; soft-touch, more durable 4-step paint process; larger buttons (power), revamped keyboard (arrow keys); latch/hook removal for clean palmrest design; top mounted speakers for optimized audio experience (compared to previous generation)
- The HP Premium keyboard is spill-resistant and offered with optional backlit design.
- Large Touchpad with gestures support, on/off button with LED indicator
- Enhanced security features including HP Fingerprint Reader and TPM 1.2 Embedded Security Chip
- Accelerated Processing Unit and graphics from AMD
- LED-backlit display
 - HP ProBook 645: 14.0” diagonal HD or FHD or Touch FHD with camera and with WWAN
 - HP ProBook 655: 15.6” diagonal HD or 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
- One USB-C™ Charging Port, two USB 3.0 ports for fast data transfer from devices (1 charging)
- HD Audio with DTS Sound+™ optimized for high fidelity audio
- Wireless and speaker mute button to conveniently manage the connectivity and speaker.
- Flexible wireless connectivity options:
 - Broadband Wireless (WWAN)
 - Wireless LAN (WLAN)
 - Personal area network (WPAN Bluetooth®)
 - Near Field Communication (NFC)
- Choice of hard drives up to 1 TB or solid state drives up to 512 GB
- Passed MIL STD testing¹

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 645 G2 Notebook PC

HP ProBook 655 G2 Notebook PC

OPERATING SYSTEM

Preinstalled

Windows 10 Pro 64¹
Windows 10 Home 64¹
Windows 10 Home Single Language 64¹
Windows 8.1 Pro 64³
Windows 8.1 64³
Windows 7 Professional 32 (Available through downgrade rights from Windows 10 Pro 64)²
Windows 7 Professional 32 (Available through downgrade rights from Windows 10 Pro 64)
(National Academic only)²
Windows 7 Professional 64³
Windows 7 Professional 32³
Windows 7 Professional 32 (National Academic only)³
FreeDOS 2.0

Web-only Support

Windows 10 Enterprise 64¹
Windows 8.1 Enterprise 64³
Windows 7 Enterprise 64³
Windows 7 Enterprise 32³

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>.

ACCELERATED PROCESSING UNIT

AMD PRO A10-8700B APU with Radeon™ R6 Graphics (1.8 GHz, up to 3.2 GHz, 2 MB cache, 4 cores)¹
AMD PRO A8-8600B APU with Radeon™ R6 Graphics (1.6 GHz, up to 3 GHz, 2 MB cache, 4 cores)¹
AMD PRO A6-8500B APU with Radeon™ R5 Graphics (1.6 GHz, up to 3 GHz, 2 MB cache, 2 cores)¹

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.

FUSION CONTROLLER HUB (FCH)

Chipset is integrated with processor



Not all configuration components are available in all regions/countries.
c04797374 – DA 15389 – World Wide – Version 10 – April 14, 2017

Technical Specifications

GRAPHICS

Radeon™ R5 Graphics

Radeon™ R6 Graphics

NOTE: Integrated with processors. Please see processor section for details.

DISPLAY

HP ProBook 645

Internal

Non-Touch

14.0" diagonal LED backlight HD¹ Anti-glare 45% CG 220 nits (1366x768)

14.0" diagonal LED backlight HD¹ Anti-glare 45% CG 220 nits (1366x768) with camera

14.0" diagonal LED backlight HD¹ Anti-glare 45% CG 220 nits (1366x768) with WWAN

14.0" diagonal LED backlight HD¹ Anti-glare 45% CG 220 nits (1366x768) with camera and with WWAN

14.0" diagonal LED backlight FHD Anti-glare 60% CG 300 nits (1920x1080)

14.0" diagonal LED backlight FHD Anti-glare 60% CG 300 nits (1920x1080) with camera

14.0" diagonal LED backlight FHD Anti-glare 60% CG 300 nits (1920x1080) with WWAN

14.0" diagonal LED backlight FHD Anti-glare 60% CG 300 nits (1920x1080) with camera & WWAN

Touch

14.0" diagonal LED backlight FHD 60% CG 300 nits (1920x1080) with camera and with WWAN

External

Up to 32-bit per pixel color depth

VGA

Port supports resolutions up to 1920 x 1200 external resolution @60 Hz

DisplayPort 1.2

Supports resolutions up to 2560 x 1600, 30-bit color depth @60 Hz, and full HD (1920 x 1080) monitors, 24-bit color depth @ 120 Hz

Number of Displays Supported

Supports 3 independent displays if used with optional HP Ultralim Docking Station²

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

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

HP ProBook 655

Internal

Non-Touch

15.6" diagonal LED backlight HD¹ Anti-glare 45% CG 220 nits (1366x768)

15.6" diagonal LED backlight HD¹ Anti-glare 45% CG 220 nits (1366x768) with camera

15.6" diagonal LED backlight HD¹ Anti-glare 45% CG 220 nits (1366x768) with WWAN

15.6" diagonal LED backlight HD¹ Anti-glare 45% CG 220 nits (1366x768) with camera and with WWAN

15.6" diagonal LED backlight FHD Anti-glare 60% CG 300 nits (1920x1080)

15.6" diagonal LED backlight FHD Anti-glare 60% CG 300 nits (1920x1080) with camera

15.6" diagonal LED backlight FHD Anti-glare 60% CG 300 nits (1920x1080) with WWAN

15.6" diagonal LED backlight FHD Anti-glare 60% CG 300 nits (1920x1080) with camera & WWAN



Technical Specifications

Touch

15.6" diagonal LED backlight FHD 60% CG 300 nits (1920 x 1080) with camera with WWAN

External

Up to 32-bit per pixel color depth

VGA

Port supports resolutions up to 1920 x 1200 external resolution @60 Hz

DisplayPort 1.2

Supports resolutions up to 2560 x 1600, 30-bit color depth at 60 Hz, and full HD (1920 x 1080) monitors, 24-bit color depth at 120 Hz

Number of Displays Supported

Supports 3 independent displays if used with optional HP Ultralim Docking Station²

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 Drives¹

Supports SATA3, 7mm

2.5" Hard Drives

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

M.2 (NGFF) Solid State Drive¹

128 GB SATA-3 TLC

180 GB SATA-3 MLC

180 GB SATA-3 MLC (Opal 2)

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

1. 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 DL¹



Technical Specifications

Blu-ray ROM DVD+/-RW SuperMulti DL¹
Weight saver²

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

DDR3L PC3-12800 (Transfer rates up to 1600 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.

NETWORKING/COMMUNICATIONS

Broadband Wireless (WWAN)^{2,3}

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

Wireless LAN (WLAN)^{1,2}

Options via Minicard
Intel® 802.11a/b/g/n/ac (2x2) and Bluetooth® 4.0 Combo
Intel® 802.11a/b/g/n/ac (1x1) 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)^{1,2}

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) Optional²



Technical Specifications

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

Realtek RTL8111HSH Gigabit Ethernet¹

1. The term "10/100/1000" or "Gigabit" Ethernet indicates compatibility with IEEE standard 802.3ab for Gigabit Ethernet, and does not connote actual operating speed of 1 Gb/s. For high-speed transmission, connection to a Gigabit Ethernet server and network infrastructure is required.

AUDIO/MULTIMEDIA

Audio

HD Audio with DTS Sound+™

(2) Integrated stereo speakers

Integrated digital microphone (Dual-microphone array when equipped with optional webcam)

Function keys for microphone mute, volume up, volume down

Stereo headphone/line out

Stereo microphone in

Webcam

Optional 720p HD webcam ^{1,2}

- HD format (widescreen)
- Supports videoconferencing (non-HD) and still image capture
- High quality fixed focus lens
- Video capture at various resolutions up to 1280x720 resolution (720p) and up to 30fps
- M-JPEG compression supports higher frame rates for video capture and videoconferencing
- Improved low light sensitivity
- Improved dynamic range
- Skype-ready

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

KEYBOARDS/POINTING DEVICES/BUTTONS & FUNCTION KEYS

HP Advanced 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.



Technical Specifications

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 DriveLock | HP Automatic Drive Lock
HP BIOS Protection¹
HP Disk Sanitizer²
HP SpareKey³
Update via Network
Master Record Security
Power On Authentication
Pre-Boot Security
Secure Erase⁴
Hybrid Boot
Measured Boot
Secure Boot
Absolute Persistence Module⁵

MultiMedia

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

Communication

HP Connection Manager (Windows 7 only)
HP GPS and Location⁶ (Windows 7 only)
HP Mobile Connect⁷ (Windows 8 only)
HP Wireless Hotspot⁸ (Windows 8 only)



Technical Specifications

Intel WiDi Software⁹
HP Roaming Alert (Windows 8 only)
Intel My WiFi and Wireless Drivers

HP Value Add Software

HP 3D DriveGuard (requires Windows)
HP ePrint Driver¹⁰ (HP Exclusive)
HP PageLift (HP Exclusive)¹¹
HP Recovery Manager (Windows 7 only)
HP Support Assistant
HP Recovery Disc Creator (Windows 7 only)
UEFI System Diagnostics W8

3rd Party

Adobe Flash Player
Skype¹² (subscription required and sold separately)
Buy Office

Security Hardware

HP Client Security¹³
HP Credential Manager
HP Password Manager
HP Drive Encryption (FIPS 140-2)¹⁴
HP Device Access Manager with Just In Time Authentication
HP File Sanitizer¹⁵
HP Spare Key
Integrated Smart Card Reader (FIPS 201)
Security screw for bottom access door
Microsoft Security Essentials (Windows 7)¹⁶
Microsoft Defender (Windows 8)
TPM 1.2/2.0¹⁷
HP Fingerprint reader
Security lock slot
Integrated Smart Card Reader

1. HP Tools partition with an HP BIOS required for automatic recovery.
2. For the use cases outlined in the DOD 5220.22-M Supplement. Does not support Solid State Drives (SSDs). Initial setup required. Web history deleted only in Internet Explorer and Firefox browsers and must be user enabled.
3. Requires initial user set up.
4. For the methods outlined in the National Institute of Standards and Technology Special Publication 800-88.
5. The Absolute Persistence 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.
6. 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.
7. Internet access required.



Technical Specifications

8. The wireless hotspot application requires an active internet connection and separately purchased data plan. While HP wireless hotspot is active, on-device applications will continue to work and will use the same data plan as the wireless hotspot. Wireless hotspot data usage may incur additional charges. Check with your service provider for plan details. Requires Windows 8.1 or HP Connection Manager for Windows 7.
9. 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.
10. Requires an Internet connection to HP web-enabled printer and HP ePrint account registration (for a list of eligible printers, supported documents and image types and other HP ePrint details, see www.hp.com/go/eprintcenter). Requires optional broadband module. Broadband use requires separately purchased service contract. Check with service provider for coverage and availability in your area. Separately purchased data plans or usage fees may apply. Print times and connection speeds may vary.
11. HP PageLift requires Windows 7 or higher edition.
12. Skype is not offered in China.
13. Not all features are remotely manageable.
14. Requires Windows. Data is protected prior to Drive Encryption login. Turning the PC off or into hibernate logs out of Drive Encryption and prevents data access. Drive encryption planned to be available in October 2013.
15. For the use cases outlined in the DOD 5220.22-M Supplement. Does not support Solid State Drives (SSDs). Initial setup required. Web history deleted only in Internet Explorer and Firefox browsers and must be user enabled.
16. Opt in and internet connection required for updates.
For more information on HP security solutions refer to: <http://www.hp.com/go/security>.
17. This product ships with TPM 1.2 with option to upgrade to TPM 2.0. Upgrade utility is expected to be available by the second half of 2016 via HP Customer Support.

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 Life¹

HP ProBook 645 Notebook PC	UMA Graphics	Discrete Graphics
3-cell (48 Whr) with SSD	Up to 8 hrs 15 mins	N/A
3-cell (48 Whr) with HDD	Up to 7 hrs 15 mins	N/A
HP ProBook 655 Notebook PC	UMA Graphics	Discrete Graphics
3-cell (48 Whr) with SSD	Up to 8 hrs	N/A
3-cell (48 Whr) with HDD	Up to 7 hrs 15 mins	N/A



Technical Specifications

System Standby Time²

	UMA Graphics	Discrete Graphics
HP ProBook 640 Notebook PC	Up to 186 hrs	N/A
HP ProBook 650 Notebook PC	Up to 186 hrs	N/A

Battery recharge times

	ProBook 645 G2	ProBook 655 G2
Time to 90% Charge ³ (minutes)	109	109
Time to 100% Charge ⁴ (minutes)	167	167

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.

3. Recharges your battery up to 90% within 109 minutes when the system is off. Applies to 3-cell 48Whr battery only. When the PC is powered on, charge time may increase and will vary based on the workload of the notebook PC.

4. Recharges your battery up to 100% within 167 minutes when the system is off. Applies to 3-cell 48Whr battery only. When the PC is powered on, charge time may increase and will vary based on the workload of the notebook PC.

WEIGHTS & DIMENSIONS

HP ProBook 645 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)

HP ProBook 655 Notebook PC

Weight

Starting at 5.1 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)



Technical Specifications

Dimensions (w x d x h)

14.88 x 10.11 x 1.07 in (Front and rear)²

37.8 x 25.7 x 2.74 cm (Front and rear)

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

PORTS/SLOTS

Ports

USB TypeC™ - 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 -One

VGA port – One

Serial port optional – One (HP ProBook 655 Notebook PC only)¹

SD Media Reader Slot

Supports SD, SDHC, SDXC

1. Sold separately or as an optional feature.

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. Optional¹ HP Care Pack Services² 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/gp/cpc>.

1. Sold separately or as an optional feature.
2. Service levels and response times for HP Care Packs may vary depending on your geographic location. Service starts on date of hardware purchase. Restrictions and limitations apply. Consult the HP Customer Support Center for details. <http://h20000.www2.hp.com/bizsupport/TechSupport/ProductRoot.jsp>



Technical Specifications

SYSTEM UNIT

TBD

DISPLAYS*

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

Panel

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

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



Technical Specifications

Panel

Active Area (W x H)	309.40 x 173.95 (mm)
Dimensions (W x H)	320.9 x 205.6 (mm) max
Diagonal Size	14 (inch)
Thickness	3.6 (mm) max
Weight	320 g max
Interface	eDP 1.2
Surface Treatment	Anti-Glare (AG)
Contrast Ratio	300:1 (typical)
Refresh Rate	60 Hz
Brightness	220 nits
Pixel Resolution - Format	1280 x 768 (HD)
PPI	112
Pixel Resolution - Configuration	RGB
Backlight	LED
Color Gamut Coverage	45%
Color Depth	6 bits + Hi FRC
Viewing Angle	SVA 45/45/25/35

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



Technical Specifications

Panel

Active Area (W x H)	309.40 x 173.95 (mm)
Dimensions (W x H)	320.9 x 205.6 (mm) max
Diagonal Size	14 (inch)
Thickness	3.0 (mm) max
Weight	270 g max
Interface	eDP 1.2
Contrast Ratio	300:1 (typical)
Refresh Rate	60 Hz
Brightness	300 nits
Pixel Resolution - Format	1920 x 1080 (FHD)
PPI	157
Pixel Resolution - Configuration	RGB
Backlight	LED
Color Gamut Coverage	60%
Color Depth	6 bits
Viewing Angle	SVA 45/45/25/35
Touch Enabled	Optional
Touch Point Supported	10-point multi-touch
Other Features	AS
Pen Enabled	No

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



Technical Specifications

Panel

Active Area (W x H)	344.2 x 193.5 (mm)
Dimensions (W x H)	360 x 224.3 (mm) max
Diagonal Size	15.6 (inch)
Thickness	3.2 (mm) max
Weight	360 g max
Interface	eDP 1.2
Surface Treatment	Anti-Glare (AG)
Contrast Ratio	400:1 (typical)
Refresh Rate	60 Hz
Brightness	300 nits
Pixel Resolution - Format	1920 x 1080 (FHD)
PPI	142
Pixel Resolution - Configuration	RGB
Backlight	LED
Color Gamut Coverage	60%
Color Depth	6 bits
Viewing Angle	SVA 45/45/25/35

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



Technical Specifications

Panel

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

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



Technical Specifications

Panel

Active Area (W x H)	344.2 x 193.5 (mm)
Dimensions (W x H)	360 x 224.3 (mm) max
Diagonal Size	15.6 (inch)
Thickness	3.2 (mm) max
Weight	360 g max
Interface	eDP 1.2
Contrast Ratio	400:1 (typical)
Refresh Rate	60 Hz
Brightness	300 nits
Pixel Resolution - Format	1920 x 1080 (FHD)
PPI	142
Pixel Resolution - Configuration	RGB
Backlight	LED
Color Gamut Coverage	60%
Color Depth	6 bits
Viewing Angle	SVA 45/45/25/35
Touch Enabled	Optional
Touch Point Supported	10-point multi-touch
Other Features	AS
Pen Enabled	No

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

SECURITY



Technical Specifications

HP Fingerprint Reader (optional)	Mobile Voltage Operation	3.0V-3.6V	
	Operating Temperature	14° – 167°F (-10° – 75°C)	
	Current Consumption Image	36 mA peak	
	Low Latency Wait for Finger	950 uA	
	Capture Rate	59000 lines/sec	
	ESD Resistance	IEC 61000-4-2 4B (±15KV)	
	Detection Matrix	200*1 (plus another secondary line) 508 dpi 10*1 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 and AB smart cards	
	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	<ul style="list-style-type: none"> • 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 		



Technical Specifications

- 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.

NETWORKING/COMMUNICATIONS

HP It4120 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, 20MHz BW WCDMA R99, 3GPP Release 5, 6, 7 and 8 UMTS Specification 1xEVDO Release 0, A and B. E-GPRS: Class B, Multi-slot class 12, coding schemes CS1 - CS4 and MSC1 - MSC9
GPS	Standalone, A-GPS (MS-A, MS-B and XTRA)
GPS bands	1575.42 MHz ± 1.023 MHz, GLONASS 1596-1607MHz
Maximum data rates	LTE: 150 Mbps (Download), 50 Mbps (Upload) DC-HSPA+: 42 Mbps (Download), 5.76 Mbps (Upload) HSPA+: 21Mbps (Download), 5.76 Mbps (Upload) CDMA 1xRTT: 153.6 kbps (Download), 153.6 kbps (Upload) EVDO Rel.A: 3.1 Mbps (Download), 1.8 Mbps (Upload) EVDO Rel.B: 14.7 Mbps (Download), 5.4Mbps (Upload) EDGE: 236.8 kbps (Download), 236.8 kbps (Upload) GPRS: 85.6 kbps(Download), 85.6 kbps (Upload)



Technical Specifications

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 all areas. Contact service provider to determine the coverage area and availability. Connection speeds will vary due to location, environment, network conditions, and other factors. 4G LTE not available on all products or in all countries.

Technology/Operating bands	HP hs3110 HSPA+ Intel® Mobile Broadband Module* HSPA+: 2100 (Band1), 1900 (Band 2), 1700 (Band 4), 850 (Band 5), 900 (Band 8) MHz E-GPRS: 1900 (Band 2), 1800 (Band 3), 850 MHz (Band 5), 900 (Band 8) MHz
Wireless protocol standards	WCDMA R99, 3GPP Release 5, 6 and 7 UMTS Specification E-GPRS: Class B, Multi-slot class 33, coding schemes CS1 - CS4 and MSC1 - MSC9
GPS	Standalone, A-GPS
GPS bands	1575.42 MHz ± 1.023 MHz
Maximum data rates	HSPA+: 21.6 Mbps (Download), 5.76 Mbps (Upload) E-GPRS: 296 kbps (Download), 236.8 kbps (Upload) GPRS: 107 kbps (Download), 85.6 kbps (Upload)
Maximum output power	HSPA+: 24 dBm E-GPRS 1800/1900: 26 dBm E-GPRS 850/900: 27 dBm GPRS 1800/1900: 30 dBm GPRS 850/900: 33 dBm
Maximum power consumption	HSPA+: 1,100 mA (peak); 800 mA (average) E-GPRS: 2,800 mA (peak); 700 mA (average)
Form Factor	M.2, 3042-S3 Key B
Weight	6 g
Dimensions (Length x Width x Thickness)	1.65 x 1.18 x 0.09 in (42 x 30 x 2.3 mm)

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



Technical Specifications

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

Wireless LAN Standards	IEEE 802.11a IEEE 802.11b IEEE 802.11g IEEE 802.11n IEEE 802.11ac
Interoperability	Wi-Fi certified
Frequency Band	802.11b/g/n <ul style="list-style-type: none">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 <ul style="list-style-type: none">4.9 – 4.95 GHz (Japan)5.15 – 5.25 GHz5.25 – 5.35 GHz5.47 – 5.725 GHz5.825 – 5.850 GHz Note: Indonesia no support this band)
Data Rates	<ul style="list-style-type: none">802.11b: 1, 2, 5.5, 11 Mbps802.11g: 6, 9, 12, 18, 24, 36, 48, 54 Mbps802.11a: 6, 9, 12, 18, 24, 36, 48, 54 Mbps802.11n: 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
Security¹	<ul style="list-style-type: none">IEEE and WiFi compliant 64 / 128 bit WEP encryption for a/b/g mode onlyAES-CCMP: 128 bit in hardware802.1x authenticationWPA, WPA2: 802.1x. WPA-PSK, WPA2-PSK, TKIP, and AES.



Technical Specifications

	<ul style="list-style-type: none">• WPA2 certification• IEEE 802.11i• Cisco Certified Extensions, all versions through CCX4 and CCX Lite• WAPI
Network Architecture Models	Ad-hoc (Peer to Peer) Infrastructure (Access Point Required)
Roaming	IEEE 802.11 compliant roaming between access points
Output Power²	<ul style="list-style-type: none">• 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 Sensitivity³	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



Technical Specifications

	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
	<ol style="list-style-type: none"> 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
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Technical Specifications

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	<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>$\pi/4$-DQPSK</td> <td>-80 dBm</td> <td>-70 dBm</td> </tr> <tr> <td>8DPSK</td> <td>-80 dBm</td> <td>-70 dBm</td> </tr> </tbody> </table>	Modulation	0.01% BER	0.001% BER	GFSK	-80 dBm	-70 dBm	$\pi/4$ -DQPSK	-80 dBm	-70 dBm	8DPSK	-80 dBm	-70 dBm
Modulation	0.01% BER	0.001% BER											
GFSK	-80 dBm	-70 dBm											
$\pi/4$ -DQPSK	-80 dBm	-70 dBm											
8DPSK	-80 dBm	-70 dBm											
Power Consumption	Peak (Tx) 330 mW Peak (Rx) 230 mW Selective Suspend 17 mW												
Range	Legacy Up to 33 ft (10 m) BLE Up to 99 ft (30 m)												
Electrical Interface	USB 2.0 compliant												
Bluetooth Software Supported	Microsoft Windows Bluetooth Software												
Link Topology													
Electrical Interface	Point to Point, Multipoint Pico Nets up to 7 slaves												
Bluetooth Software Supported	Full support of Bluetooth Security Provisions												
Security													



Technical Specifications

Power Management	Microsoft Windows ACPI, and USB Bus Support
Certifications	Self-configurable to optimize power conservation in all operating modes, including Standby, Hold, Park, and Sniff
Security	All necessary regulatory approvals for supported countries, including:
Certifications	FCC (47 CFR) Part 15C, Section 15.247 & 15.249
Bluetooth Profiles Supported	
Power Management	ETS 300 328, ETS 300 826
Certifications	Low Voltage Directive IEC950
	UL, CSA, and CE Mark
Certifications	Serial Port Profile (SPP) ¹ Service Discovery Application Profile (SDAP) Dial-Up Networking (DUN) ^{1,2} Generic Object Exchange Profile (GOEP) ^{1,2} Object Push Profile (OPP) ^{1,2} Hard Copy Cable Replacement (HCRP) ^{1,2} Personal Area Networking Profile (PAN) ^{1,2} Human Interface Device Profile (HID) ^{1,2} Hands Free Profile (HFP) Advanced Audio Distribution Profile (A2DP)
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 Standards	IEEE 802.11a IEEE 802.11b
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Technical Specifications

	IEEE 802.11g IEEE 802.11n
Interoperability	Wi-Fi certified
Frequency Band	802.11b/g/n <ul style="list-style-type: none"> • 2.402 – 2.482 GHz <p>Note:</p> <p>The FCC has declared as of January 1, 2015 products that utilize passive scanning on channel 12/13 and are capable of transmitting must fully comply with requirements of 15.247 or otherwise disable those channels.</p>
	802.11a <ul style="list-style-type: none"> • 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 <p>Note:</p> <p>Indonesia only supports 5.725 - 5.825 GHz (CH149 - CH161)</p>
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
Security¹	<ul style="list-style-type: none"> • IEEE and WiFi compliant 64 / 128 bit WEP encryption for a/b/g mode only • AES-CCMP: 128 bit in hardware • 802.1x authentication • WPA, WPA2: 802.1x. WPA-PSK, WPA2-PSK, TKIP, and AES. • WPA2 certification • IEEE 802.11i



Technical Specifications

	<ul style="list-style-type: none"> • 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 Power²	<ul style="list-style-type: none"> • 802.11b : +16dBm minimum • 802.11g : +14dBm minimum • 802.11a : +14dBm minimum • 802.11n HT20(2.4GHz) : +13dBm minimum • 802.11n HT40(2.4GHz) : +13dBm minimum • 802.11n HT20(5GHz) : +12dBm minimum • 802.11n HT40(5GHz) : +12dBm minimum
Power Consumption	Transmit: 2.0 W (max) Receive: 1.6 W (max) Idle mode (PSP): 180 mW (WLAN Associated) Idle mode: 60 mW (WLAN unassociated) Radio disabled: 30 mW
Power Management	ACPI and PCI Express compliant power management 802.11 compliant power saving mode
Receiver Sensitivity³	802.11b, 1Mbps : -94dBm maximum 802.11b, 11Mbps : -86dBm maximum 802.11g, 6Mbps : -88dBm maximum 802.11g, 54Mbps : -74dBm maximum 802.11a, 6Mbps : -86dBm maximum 802.11a, 54Mbps : -72dBm maximum 802.11n, MCS07 : -69dBm maximum 802.11n, MCS15 : -66dBm maximum
Antenna type	High efficiency antenna with spatial diversity, mounted in the display enclosure Two embedded dual band 2.4/5 GHz antennas are provided to the card to support WLAN MIMO and Bluetooth communications
Form Factor	PCI-Express M.2 MiniCard



Technical Specifications

Dimensions	Type 2230 : 2.3 x 22.0 x 30.0 mm	
	Or	
	Type 1630 : 2.3 x 16.0 x 30.0 mm	
Weight	Type 2230 : 2.8g	
	Or	
	Type 1630 : 2g	
Operating Voltage	3.3v +/- 9%	
Temperature	Operating	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+EDR Wireless Technology

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



Technical Specifications

Transmit Power	The Bluetooth component shall operate as a Class II Bluetooth device with a maximum transmit power of +4 dBm for BR and EDR.														
Receiver Sensitivity	<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>$\pi/4$-DQPSK</td> <td>-80 dBm</td> <td>-70 dBm</td> </tr> <tr> <td>8DPSK</td> <td>-80 dBm</td> <td>-70 dBm</td> </tr> </tbody> </table>			Modulation	0.01% BER	0.001% BER	GFSK	-80 dBm	-70 dBm	$\pi/4$ -DQPSK	-80 dBm	-70 dBm	8DPSK	-80 dBm	-70 dBm
Modulation	0.01% BER	0.001% BER													
GFSK	-80 dBm	-70 dBm													
$\pi/4$ -DQPSK	-80 dBm	-70 dBm													
8DPSK	-80 dBm	-70 dBm													
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) ¹ Service Discovery Application Profile (SDAP)														



Technical Specifications

Dial-Up Networking (DUN)^{1,2}
 Generic Object Exchange Profile (GOEP)^{1,2}
 Object Push Profile (OPP)^{1,2}
 File Transfer Profile (FTP)
 Synchronization Profile (SYNC)
 Hard Copy Cable Replacement (HCRP)^{1,2}
 Personal Area Networking Profile (PAN)^{1,2}
 Human Interface Device Profile (HID)^{1,2}
 FAX Profile (FAX)
 Basic Imaging Profile (BIP)²
 Headset Profile (HSP)
 Hands Free Profile (HFP)
 Advanced Audio Distribution Profile (A2DP)

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



Technical Specifications

must fully comply with requirements of 15.247 or otherwise disable those channels.

802.11a

- 4.9 – 4.95 GHz (Japan)
- 5.15 – 5.25 GHz
- 5.25 – 5.35 GHz
- 5.47 – 5.725 GHz
- 5.825 – 5.850 GHz

Note:

Indonesia only supports 5.725 - 5.825 GHz (CH149 - CH161)

Antenna Structure

2 transmit; 2 receive (2x2)

Data Rates

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

Modulation

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

Security¹

- 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 Power²

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



Technical Specifications

Power Consumption	<ul style="list-style-type: none"> 802.11a : +14dBm minimum 802.11n HT20(2.4GHz) : +13dBm minimum 802.11n HT40(2.4GHz) : +13dBm minimum 802.11n HT20(5GHz) : +12dBm minimum 802.11n HT40(5GHz) : +12dBm minimum Transmit: 2.0 W (max) Receive: 1.6 W (max) Idle mode (PSP): 180 mW (WLAN Associated) Idle mode: 60 mW (WLAN unassociated) Radio disabled: 30 mW
Power Management	ACPI and PCI Express compliant power management 802.11 compliant power saving mode
Receiver Sensitivity³	802.11b, 1Mbps : -94dBm maximum 802.11b, 11Mbps : -86dBm maximum 802.11g, 6Mbps : -88dBm maximum 802.11g, 54Mbps : -74dBm maximum 802.11a, 6Mbps : -86dBm maximum 802.11a, 54Mbps : -72dBm maximum 802.11n, MCS07 : -69dBm maximum 802.11n, MCS15 : -66dBm maximum
Antenna type	High efficiency antenna with spatial diversity, mounted in the display enclosure Two embedded dual band 2.4/5 GHz antennas are provided to the card to support WLAN MIMO and Bluetooth communications
Form Factor	PCI-Express M.2 MiniCard
Dimensions	Type 2230 : 2.3 x 22.0 x 30.0 mm Or Type 1630 : 2.3 x 16.0 x 30.0 mm
Weight	Type 2230 : 2.8g Or Type 1630 : 2g
Operating Voltage	3.3v +/- 9%



Technical Specifications

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+EDR Wireless Technology

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

Receiver Sensitivity

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



Technical Specifications

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 UL, CSA, and CE Mark
Certifications	Serial Port Profile (SPP) ¹ Service Discovery Application Profile (SDAP) Dial-Up Networking (DUN) ^{1,2} Generic Object Exchange Profile (GOEP) ^{1,2} Object Push Profile (OPP) ^{1,2} File Transfer Profile (FTP) Synchronization Profile (SYNC) Hard Copy Cable Replacement (HCRP) ^{1,2} Personal Area Networking Profile (PAN) ^{1,2} Human Interface Device Profile (HID) ^{1,2} FAX Profile (FAX) Basic Imaging Profile (BIP) ²
Bluetooth Profiles Supported	



Technical Specifications

Headset Profile (HSP)
Hands Free Profile (HFP)
Advanced Audio Distribution Profile (A2DP)

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

Wireless LAN Standards	IEEE 802.11b IEEE 802.11g IEEE 802.11n
Interoperability	Wi-Fi certified
Frequency Band	802.11b/g/n <ul style="list-style-type: none"> 2.402 – 2.482 GHz <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>
Data Rates	802.11b: 1, 2, 5.5, 11 Mbps 802.11g: 6, 9, 12, 18, 24, 36, 48, 54 Mbps 802.11n: MCS 0 ~ MCS 07, (20MHz)
Modulation	Direct Sequence Spread Spectrum BPSK, QPSK, CCK, 16-QAM, 64-QAM,
Security¹	<ul style="list-style-type: none"> 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 Models	Ad-hoc (Peer to Peer) Infrastructure (Access Point Required)
Roaming	IEEE 802.11 compliant roaming between access points
Output Power²	<ul style="list-style-type: none"> 802.11b : +16dBm minimum 802.11g : +14dBm minimum 802.11n HT20(2.4GHz) : +13dBm minimum



Technical Specifications

- 802.11n HT40(2.4GHz) : +13dBm minimum
- 802.11n HT20(5GHz) : +12dBm minimum
- 802.11n HT40(5GHz) : +12dBm minimum

Power Consumption

Transmit: 2.0 W (max)
Receive: 1.6 W (max)
Idle mode (PSP): 180 mW (WLAN Associated)
Idle mode: 60 mW (WLAN unassociated)

Radio disabled: 30 mW

Power Management

ACPI and PCI Express compliant power management
802.11 compliant power saving mode

Receiver Sensitivity³

802.11b, 1Mbps : -94dBm maximum

802.11b, 11Mbps : -86dBm maximum

802.11g, 6Mbps : -88dBm maximum

802.11g, 54Mbps : -74dBm maximum

802.11n, MCS07 : -69dBm maximum

802.11n, MCS15 : -66dBm maximum

Antenna type

High efficiency antenna with spatial diversity, mounted in the display enclosure

Two embedded antennas for 2.4GHz are provided to the card to support WLAN and Bluetooth communications.
(Support Dual antenna or Single antenna, depend on platform requirement)

Form Factor

PCI-Express M.2 MiniCard

Dimensions

Type 2230 : 2.3 x 22.0 x 30.0 mm

Or
Type 1630 : 2.3 x 16.0 x 30.0 mm

Weight

Type 2230 : 2.8g

Or
Type 1630 : 2g



Technical Specifications

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

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

HP Integrated Module with Bluetooth 4.0+EDR Wireless Technology

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

Receiver Sensitivity

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



Technical Specifications

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 UL, CSA, and CE Mark
Certifications	Serial Port Profile (SPP) ¹ Service Discovery Application Profile (SDAP) Dial-Up Networking (DUN) ^{1,2} Generic Object Exchange Profile (GOEP) ^{1,2} Object Push Profile (OPP) ^{1,2} File Transfer Profile (FTP) Synchronization Profile (SYNC) Hard Copy Cable Replacement (HCRP) ^{1,2} Personal Area Networking Profile (PAN) ^{1,2} Human Interface Device Profile (HID) ^{1,2} FAX Profile (FAX) Basic Imaging Profile (BIP) ²
Bluetooth Profiles Supported	



Technical Specifications

Headset Profile (HSP)
Hands Free Profile (HFP)
Advanced Audio Distribution Profile (A2DP)

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

Wireless LAN Standards	IEEE 802.11b IEEE 802.11g IEEE 802.11n
Interoperability	Wi-Fi certified
Frequency Band	802.11b/g/n <ul style="list-style-type: none"> 2.402 – 2.482 GHz <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>
Data Rates	802.11b: 1, 2, 5.5, 11 Mbps 802.11g: 6, 9, 12, 18, 24, 36, 48, 54 Mbps 802.11n: MCS 0 ~ MCS 07, (20MHz)
Modulation	Direct Sequence Spread Spectrum BPSK, QPSK, CCK, 16-QAM, 64-QAM,
Security¹	<ul style="list-style-type: none"> 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 Models	Ad-hoc (Peer to Peer) Infrastructure (Access Point Required)
Roaming	IEEE 802.11 compliant roaming between access points
Output Power²	<ul style="list-style-type: none"> 802.11b : +16dBm minimum 802.11g : +14dBm minimum 802.11n HT20(2.4GHz) : +13dBm minimum



Technical Specifications

- 802.11n HT40(2.4GHz) : +13dBm minimum
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- 802.11n HT40(5GHz) : +12dBm minimum

Power Consumption

Transmit: 2.0 W (max)
Receive: 1.6 W (max)
Idle mode (PSP): 180 mW (WLAN Associated)
Idle mode: 60 mW (WLAN unassociated)

Radio disabled: 30 mW

Power Management

ACPI and PCI Express compliant power management
802.11 compliant power saving mode

Receiver Sensitivity³

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

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Antenna type

High efficiency antenna with spatial diversity, mounted in the display enclosure

Two embedded antennas for 2.4GHz are provided to the card to support WLAN and Bluetooth communications.
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Type 2230 : 2.3 x 22.0 x 30.0 mm

Or
Type 1630 : 2.3 x 16.0 x 30.0 mm

Weight

Type 2230 : 2.8g

Or
Type 1630 : 2g



Technical Specifications

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

7. Check latest software/driver release for updates on supported security features.
8. Maximum output power may vary by country according to local regulations.
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$\pi/4$ -DQPSK	-80 dBm	-70 dBm
8DPSK	-80 dBm	-70 dBm



Technical Specifications

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
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Bluetooth Profiles Supported	



Technical Specifications

Headset Profile (HSP)
 Hands Free Profile (HFP)
 Advanced Audio Distribution Profile (A2DP)

STORAGE AND DRIVES

500 GB 7200rpm Self Encrypting Drive (FIPS-140-2) (Opal 2)

Drive Weight	0.21 lbs (95 g)
Capacity	500 GB
Height	0.28 in (7 mm)
Width	2.75 in (69.85 mm)
Interface	ATA-8, SATA 3.0
Transfer Rate	Synchronous (maximum) 600 MB/s
Seek Time (typical reads, including settling)	Single Track 1.5 ms Average 12ms Maximum 18mm-22ms
Cache	32GB
Rotational Speed	7200 rpm
Logical Blocks	976,773,168
Operating Temperature	32° to 140° F (0° to 60° C) [top cover temp]
Features	ATA Security; TCG Opal 2.x, FIPS, S.M.A.R.T., NCQ, Ultra DMA 5

500 GB 7200rpm Hard Drive

Drive Weight	0.20 lbs (92 g)-0.21 lbs (95 g)
Capacity	500 GB
Height	0.28 in (7 mm)
Width	2.75 in (69.85 mm)
Interface	ATA-8, SATA 3.0
Transfer Rate	Synchronous (maximum) 600 MB/s
Seek Time (typical reads, including settling)	Single Track 1.5ms-2.0ms Average 11ms-13ms Maximum 18ms-22ms
Cache	32GB
Rotational Speed	7200 rpm
Logical Blocks	976,773,168
Operating Temperature	32° to 140° F (0° to 60° C) [case temp]
Features	ATA Security

500 GB 7200rpm Self-Encrypting Drive (Opal 2)

Drive Weight	0.21 lbs (95 g)
Capacity	500GB
Height	0.28 in (7 mm)
Width	2.75 in (69.85 mm)



Technical Specifications

Interface	ATA-8, SATA 3.0
Transfer Rate	Synchronous (maximum) 600 MB/s
Seek Time (typical reads, including settling)	Single Track 1.5ms Average 12ms Maximum 18ms- 22ms
Cache	32GB
Rotational Speed	7200rpm
Logical Blocks	976,773,168
Operating Temperature	32° to 140° F (0° to 60° C) [top cover temp]
Features	ATA Security; TCG Opal 2.x, S.M.A.R.T., NCQ, Ultra DMA

1 TB 5400rpm Hard Drive	Drive Weight	0.21 lbs (94 g)- 0.21 lbs (99 g)
	Capacity	1TB
	Height	0.28 in (7.2 mm)
	Width	2.75 in (69.85 mm)
	Interface	ATA-8, SATA 3.0
	Transfer Rate	Synchronous (maximum) 600 MB/s
	Seek Time (typical reads, including settling)	Single Track 2ms Average 12ms-13ms Maximum 18ms-23ms
	Cache	Up to 32GB
	Rotational Speed	5400rpm
	Logical Blocks	1,953,525,168
	Operating Temperature	32° to 140° F (0° to 60° C) [case temp]
	Features	S.M.A.R.T., NCQ, Ultra DMA

500 GB Hybrid, 8 GB cache	Drive Weight	0.21 lb (95 g)
	Capacity	500 GB
	Height	0.276 in (7 mm)
	Width	2.76 in (70.1 mm)
	Interface	ATA-8, SATA 2.6, 6.0 Gb/s, NCQ
	Transfer Rate	Synchronous (maximum) 600 MB/s (Drive Capability)
	Seek Time (typical reads, including settling)	Single Track 2 ms Average 12 ms Maximum NIL ms
	Cache	64GB
	Rotational Speed	5400 rpm
	Logical Blocks	976,773,168
	Operating Temperature	32° to 140° F (0° to 60° C) [case temp]
	Features	ATA Security



Technical Specifications

128 GB M2 2280 SATA-3 TLC Solid State Drive	Drive Weight	0.019 lb (8.5 g)-0.022 lb (10 g)		
	Capacity	128 GB		
	Height	0.09 in (2.23 mm)- 0.14 in (3.58 mm)		
	Width	0.87 in (22 mm)		
	Interface	ATA-8, SATA 3.0		
	Performance	Maximum Sequential Read	Maximum Sequential Write	
		500 ~ 540 MB/s	130 ~ 450 MB/s	
	Logical Blocks	250,069,680		
	Operating Temperature	32° to 158°F (0° to 70°C) [ambient temp]		
	Features	ATA Security, DIPM; TRIM; DEVSLP		

180 GB M2 2280 SATA-3 MLC Solid State Drive	Drive Weight	0.022 lb (<10 g)		
	Capacity	180 GB		
	Height	0.09 in (2.23 mm)		
	Width	0.87 in (22 mm)		
	Interface	ATA-8, SATA 3.0		
	Performance	Maximum Sequential Read	Maximum Sequential Write	
		540 MB/s	490 MB/s	
	Logical Blocks	351,651,888		
	Operating Temperature	32° to 158°F (0° to 70°C) [ambient temp]		
	Features	ATA Security, DIPM; TRIM; DEVSLP		

180 GB M2 2280 SATA-3 Self-Encrypting Drive (Opal 2) MLC Solid State Drive	Drive Weight	0.022 lb (<10 g)		
	Capacity	180GB		
	Height	0.09 in (2.23 mm)		
	Width	0.87 in (22 mm)		
	Interface	ATA-8, SATA 3.0		
	Performance	Maximum Sequential Read	Maximum Sequential Write	
		540 MB/s	490 MB/s	
	Logical Blocks	351,651,888		
	Operating Temperature	32° to 158°F (0° to 70°C) [ambient temp]		
	Features	ATA Security, TCG OPAL 2.x, DIPM; TRIM; DEVSLP		

240 GB SATA-3 MLC Solid State Drive	Drive Weight	0.02 lb (10 g)	
	Capacity	240 GB	
	Height	0.14 in (3.58 mm)	
	Width	0.87 in (22 mm)	
	Interface	ACS-3, SATA 3.2	



Technical Specifications

	Performance	Maximum Sequential Read	Maximum Sequential Write
		540 MB/s	490 MB/s
	Logical Blocks	468,862,128	
	Operating Temperature Features	32° to 158°F (0° to 70°C) [ambient temp] ATA Security, DIPM; TRIM; DEVSLP	
256 GB 2280 SATA-3 TLC Solid State Drive	Drive Weight	0.019 lb (8.5 g)- 0.022 lb (10 g)	
	Capacity	256GB	
	Height	0.09 in (2.3 mm)- 0.14 in (3.58 mm)	
	Width	0.87 in (22 mm)	
	Interface	ATA-8, SATA 3.0	
	Performance	Maximum Sequential Read	Maximum Sequential Write
		515 ~ 540 MB/s	260 ~ 515 MB/s
	Logical Blocks	500,118,192	
	Operating Temperature Features	32° to 158°F (0° to 70°C) [ambient temp] ATA Security, DIPM; TRIM; DEVSLP	
256 GB PCIe-3x4 NVMe Solid State Drive	Drive Weight	0.02 lb (10 g)	
	Capacity	256 GB	
	Height	0.09 in (2.3 mm)	
	Width	0.87 in (22 mm)	
	Interface	PCIe NVMe Gen3X4	
	Performance	Maximum Sequential Read	Maximum Sequential Write
		2260 ~3100 MB/s	1100 ~ 1400 MB/s
	Logical Blocks	500,118,192	
	Operating Temperature Features	32° to 158°F (0° to 70°C) [ambient temp] ATA Security, TRIM; L1.2	
256 GB M2 2280 SATA-3 Self-Encrypting Drive (Opal 2) MLC Solid State Drive	Drive Weight	0.02 lb (10 g)	
	Capacity	256 GB	
	Height	0.14 in (3.58 mm)- 0.09 in (2.23 mm)	
	Width	0.87 in (22 mm)	
	Interface	ATA-8, SATA 3.0	
	Performance	Maximum Sequential Read	Maximum Sequential Write
		450 ~ 540 MB/s	370 ~ 500 MB/s
	Logical Blocks	500,118,192	
	Operating Temperature Features	32° to 158°F (0° to 70°C) [ambient temp] ATA Security; TCG Opal 2.0, DIPM; TRIM; DEVSLP	
	Drive Weight	0.019 lb (8.5 g)- 0.02 lb (10 g)	



Technical Specifications

512 GB M2 2280 TLC Solid State Drive	Capacity	512 GB	
	Height	0.09 in (2.3 mm)	
	Width	0.87 in (22 mm)	
	Interface	ATA-8, SATA 3.0	
	Performance	Maximum Sequential Read	Maximum Sequential Write
		500 ~ 540 MB/s	440 ~ 515 MB/s
	Logical Blocks	1,000,215,216	
Operating Temperature	32° to 158°F (0° to 70°C) [ambient temp]		
Features	ATA Security, DIPM; TRIM; DEVSLP		

512 GB M2 2280 SATA-3 Self-Encrypting Drive (Opal 2) MLC Solid State Drive	Drive Weight	0.019 lb (8.5 g)- 0.02 lb (10 g)	
	Capacity	512 GB	
	Height	0.09 in (2.3 mm)	
	Width	0.87 in (22 mm)	
	Interface	ATA-8, SATA 3.0	
	Performance	Maximum Sequential Read	Maximum Sequential Write
		500 ~ 540 MB/s	440 ~ 515 MB/s
Logical Blocks	1,000,215,216		
Operating Temperature	32° to 158°F (0° to 70°C) [ambient temp]		
Features	ATA Security, DIPM; TRIM; DEVSLP; TCG Opal 2.0		

ENVIRONMENTAL

HP ProBook 645 G2 Notebook PC

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

- IT ECO declaration
- US ENERGY STAR®
- EPEAT <Gold> registered in the United States. See <http://www.epeat.net> for registration status in your country.

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

Energy Consumption (in accordance with US	115VAC, 60Hz	230VAC, 50Hz	100VAC, 60Hz
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Not all configuration components are available in all regions/countries.
 c04797374 – DA 15389 – World Wide – Version 10 – April 14, 2017

Technical Specifications

ENERGY STAR® test method)

Normal Operation (Sort idle)	7.08 W	7.64 W	6.65 W
Normal Operation (Long idle)	4.38 W	5.13 W	4.28 W
Sleep	0.48 W	0.59 W	0.47 W
Off	0.38 W	0.49 W	0.37 W

Note:

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

Heat Dissipation*	115VAC, 60Hz	230VAC, 50Hz	100VAC, 60Hz
Normal Operation (Short idle)	24 BTU/hr	26 BTU/hr	23 BTU/hr
Normal Operation (Long idle)	15 BTU/hr	18 BTU/hr	15 BTU/hr
Sleep	2 BTU/hr	2 BTU/hr	2 BTU/hr
Off	1 BTU/hr	2 BTU/hr	1 BTU/hr

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

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

Sound Power
(L_{WAd}, bels)

Sound Pressure
(L_{pAm}, decibels)



Technical Specifications

Typically Configured – Idle	3.1	21
Fixed Disk – Random writes	3.5	28

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

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

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

Batteries

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

Batteries used in the product do not contain:

- Mercury greater than 1ppm by weight
- Cadmium greater than 20ppm by weight

Battery size: CR2032 (coin cell)

Battery type: Lithium

Additional Information

- This product is in compliance with the Restrictions of Hazardous Substances (RoHS) directive - 2011/65/EC.
- This HP product is designed to comply with the Waste Electrical and Electronic Equipment (WEEE) Directive – 2002/96/EC.
- This product is in compliance with California Proposition 65 (State of California; Safe Drinking Water and Toxic Enforcement Act of 1986).
- This product is in compliance with the IEEE 1680 (EPEAT) standard at the <Gold> level, see www.epeat.net
- Plastics parts weighing over 25 grams used in the product are marked per ISO11469 and ISO1043.
- This product contains 0.0% post-consumer recycled plastic (by wt.)
- This product is 95.8% recycle-able when properly disposed of at end of life.

Packaging Materials

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

The plastic packaging material contains at least 50% recycled content.



Technical Specifications

Material Usage

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

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)



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.

Hewlett-Packard Corporate Environmental Information

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

Global Citizenship Report

<http://www.hp.com/hpinfo/globalcitizenship/gcreport/index.html>

Eco-label certifications

<http://www8.hp.com/us/en/hp-information/environment/ecolabels.html>

ISO 14001 certificates:

<http://h20195.www2.hp.com/V2/GetDocument.aspx?docname=c04755842>

and

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

HP ProBook 655 G2 Notebook PC

TBD

COUNTRY OF ORIGIN

China



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

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



Summary of Changes

Date of change:	Version History:		Description of change:
January 21, 2016	Version 1 to 2	Added	645 Environmental data
January 29, 2016	Version 2 to 3	Updated	MIL STD testing Battery life and stand by time Display descriptions with CG and nits
February 18, 2016	Version 3 to 4	Added	Security specs to the back for Finger Print Reader and Smart Card Reader
February 18, 2016	Version 4 to 5	Updated	Intel® 802.11a/b/g/n/ac specs to 4.0
		Added	Specs for panels
March 3, 2016	Version 5 to 6	Added	Battery recharge times
March 31, 2016	Version 6 to 7	Changed	TPM Upgrade footnote
June 8, 2016	Version 7 to 8	Added	Storage and drives section
March 24, 2017	Version 8 to 9	Updated	Displays Section updated
April 14, 2017	Version 9 to 10	Updated	Storage and Drives Section Updated

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