Overview

HP ProBook 450 G8 Notebook PC

Left

1. Internal Microphones (2)
2. Webcam LED (Optional)
3. HD Camera (Optional)
4. Camera Shutter (Only available with webcam)
5. Clickpad
6. USB 3.1 Gen 1 Powered Port
7. Ethernet Port (RJ-45)
8. Nano Security Lock Slot (Lock sold separately)

Not all configuration components are available in all regions/countries.
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Overview

Right

1. Power Button Key
2. Power Connector
3. USB Type-C® 3.1 Gen 2 (Alt Mode)
4. USB 3.1 Gen 1 Charging Port
5. USB 3.1 Gen 1 Port

6. HDMI Port (Cable not included)
7. Audio Combo Jack
8. Micro SD Card Reader
9. Touch Fingerprint Sensor (select models)

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Overview

At a Glance

- A new compact design with lift-anywhere edge
- Choice of 11th generation Intel® Core™ i7, i5 and i3 processors
- Preinstalled with Windows 10 versions or FreeDOS
- Optional NVIDIA GeForce MX450 discrete graphics with 2GB GDDR5 video memory
- Fast and upgradeable dual channel DDR4 SODIMM memory up to 32 GB
- Choice of 39.62 cm (15.6") diagonal HD, Ultra Wide Viewing Angle FHD, Touch or Non-Touch screen, and Privacy Panel option
- to Features redesigned quiet and responsive HP Keyboard with numeric keypad, the HP Programmable key and backlit options
- Choice of solid state drives up to 1TB
- Multi-layered security with HP SureStart Gen6, HP Privacy Camera, HP Sure View Gen3 [1], HP Sure Sense, HP Sure Click, and Touch Fingerprint reader [2]
- Supports wireless options for connectivity on the go including gigabit-speed Wi-Fi 6 and CAT9 4G/LTE WWAN
- Supports fast charging (50% in 30 minutes) with no impact on battery recharge cycles [3]
- Designed to support HP docking options including the HP Universal Dock G5
- Passed MIL-STD 810H tests[4]
- Battery life up to 12 hours and 30 minutes

1. HP Sure View integrated privacy screen is an optional feature that must be configured at purchase and is designed to function in landscape orientation.
2. Sold separately or as an optional feature
3. HP Notebooks up to 50% within 30 minutes when the system is off or in standby mode. Power adapter with a minimum capacity of 65 watts is required. After charging has reached 50% capacity, charging will return to normal. Charging time may vary +/-10% due to System tolerance.
4. MIL STD 810H 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. 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.

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PRODUCT NAME

HP ProBook 450 G8 Notebook PC

OPERATING SYSTEMS

Preinstalled   Windows 10 Pro 64 – HP recommends Windows 10 Pro[1]
Windows 10 Pro 64 (National Academic only)[2]
Windows 10 Home 64[1]
Windows 10 Home Single Language 64[1]
Windows 10 Pro (Windows 10 Enterprise available with a Volume Licensing Agreement)[1]
FreeDOS

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.
2. Some devices for academic use will automatically be updated to Windows 10 Pro Education with the Windows 10 Anniversary Update. Features vary; see https://aka.ms/ProEducation for Windows 10 Pro Education feature information.

Supported Versions
HP tested Windows 10, version 1809 on this platform. For testing information on newer versions of Windows 10, please see https://support.hp.com/document/c05195282

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. A full list of HP products and the Windows 10 versions tested is available on the HP support website. https://support.hp.com/us-en/document/c05195282.

PROCESSORS

Intel® Core™ i7-1165G7 processor with Intel® Iris® X⁵ Graphics (Up to 4.7 GHz frequency with Intel® Turbo Boost Technology, 12 MB L3 cache, 4 cores) [3,4] [5,6,*]
Intel® Core™ i5-1135G7 processor with Intel® Iris® X⁵ Graphics (Up to 4.2 GHz frequency with Intel® Turbo Boost Technology, 8 MB L3 cache, 4 cores) [3,4] [5,6,*]
Intel® Core™ i3-1115G4 processor with Intel® UHD Graphics (Up to 4.1 GHz frequency with Intel® Turbo Boost Technology, 6 MB L3 cache, 2 cores) [3,4] [5,6]

Processors Family
11th Generation Intel® Core™ i7 processor (i7-1165G7)[7]
11th Generation Intel® Core™ i5 processor (i5-1135G7)[7]
11th Generation Intel® Core™ i3 processor (i3-1115G4)[7]

3. 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, branding and/or naming is not a measurement of higher performance.
4. Processor speed denotes maximum performance mode; processors will run at lower speeds in battery optimization mode.
5. Intel® Turbo Boost performance varies depending on hardware, software and overall system configuration. See http://www.intel.com/technology/turboboost for more information.

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6. Max Boost clock frequency performance varies depending on hardware, software and overall system configuration.
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.
* Intel® Iris® Xe Graphics capabilities require system to be configured with Intel® Core™ i5 or i7 processors and dual channel memory

CHIPSET

Chipset is integrated with processor

GRAPHICS

Integrated
Intel® Iris® Xe Graphics (Core i5 and Core i7)*
Intel® UHD Graphics (Core i3)

Discrete
NVIDIA® GeForce® MX450 (2 GB DDR5 dedicated) [9]

Supports
Support HD decode, DX12, HDMI 1.4b [8]

8. HD content required to view HD images.
9. Integrated graphics depends on processor. NVIDIA® Optimus™ technology requires an Intel processor, plus an NVIDIA® GeForce® discrete graphics configuration and is available on Windows 10 Pro OS. With NVIDIA® Optimus™ 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).
* Intel® Iris® Xe Graphics capabilities require system to be configured with Intel® Core™ i5 or i7 processors and dual channel memory

DISPLAYS

Internal
Non-Touch
39.6 cm (15.6") diagonal HD SVA eDP anti-glare, narrow bezel bent, 250 nits, 45% NTSC (1366 x 768) [8,11]
39.6 cm (15.6") diagonal HD SVA eDP anti-glare, narrow bezel bent, 250 nits, 45% NTSC for HD camera (1366 x 768) [8,11]
39.6 cm (15.6") diagonal HD SVA eDP anti-glare, narrow bezel bent, 250 nits, 45% NTSC for HD+IR camera (1366 x 768)[8,11]
39.6 cm (15.6") diagonal HD SVA eDP anti-glare, narrow bezel bent, 250 nits, 45% NTSC for HD camera and WWAN (1366 x 768) [8,11]
39.6 cm (15.6") diagonal FHD UWVA eDP anti-glare, narrow bezel bent, 250 nits, 45% NTSC (1920 x 1080) [8,11]
39.6 cm (15.6") diagonal FHD UWVA eDP anti-glare, narrow bezel bent, 250 nits, 45% NTSC for HD camera (1920 x 1080)[8,11]
39.6 cm (15.6") diagonal FHD UWVA eDP anti-glare, narrow bezel bent, 250 nits, 45% NTSC for HD + IR camera (1920 x 1080) [8,11]
39.6 cm (15.6") diagonal FHD UWVA eDP anti-glare, narrow bezel bent, 250 nits, 45% NTSC for HD camera and WWAN (1920 x 1080) [8,11]
39.6 cm (15.6") diagonal FHD UWVA eDP+PSR anti-glare, low power narrow bezel bent, 400 nits, 100% sRGB for HD camera (1920 x 1080) [8,11]
39.6 cm (15.6") diagonal FHD UWVA eDP+PSR anti-glare, low power narrow bezel bent, 400 nits, 100% sRGB for HD+IR camera (1920 x 1080) [8,11]
39.6 cm (15.6") diagonal FHD UWVA eDP+PSR anti-glare, narrow bezel bent with HP Sure View Gen3 Integrated Privacy Screen, 1000 nits, 100% sRGB for HD camera (1920 x 1080) [8,11,12]
39.6 cm (15.6") diagonal FHD UWVA eDP+PSR anti-glare, narrow bezel bent with HP Sure View Gen3 Integrated Privacy Screen, 1000 nits, 100% sRGB for HD+IR camera (1920 x 1080) [8,11,12]

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Touch
39.6 cm (15.6") diagonal FHD UWVA eDP anti-glare, narrow bezel bent, touch-on-panel screen, 250 nits, 45% NTSC for HD camera (1920 x 1080) [8,10,11]
39.6 cm (15.6") diagonal FHD UWVA eDP anti-glare, narrow bezel bent touch-on-panel screen, 250 nits, 45% NTSC for HD camera and WWAN (1920 x 1080) [8,10,11]

HDMI
Supports resolutions up to 4K 30Hz

8. HD content required to view HD images.
10. Sold separately or as an optional feature.
11. Resolutions are dependent upon monitor capability, and resolution and color depth settings.
12. HP Sure View integrated privacy screen is an optional feature that must be configured at purchase and is designed to function in landscape orientation.

NOTE: Actual brightness will be lower with touchscreen or Sure View.

STORAGE AND DRIVES

Primary M.2 Storage
128 GB PCIe® NVMe™ M.2 TLC Solid State Drive [13]
256 GB PCIe® NVMe™ M.2 Value Solid State Drive [13]
512 GB PCIe® NVMe™ M.2 Value Solid State Drive [13]
512 GB Intel® PCIe® NVMe™ QLC M.2 SSD with 32 GB Intel® Optane™ memory H10 [13, 40,41]
1 TB PCIe® NVMe™ M.2 TLC Solid State Drive [13]

13. For storage drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 30 GB (for Windows 10) is reserved for system recovery software.
40. Intel® Optane™ memory system acceleration does not replace or increase the DRAM in your system. Requires 8th Gen or higher Intel® Core™ processor, BIOS version with Intel® Optane™ supported, Windows 10 64-bit, and an Intel® Rapid Storage Technology (Intel® RST) driver.
41. Intel® Optane™ memory H10 only for Intel® PCIe® NVMe™ QLC M.2 SSD.

MEMORY

Maximum Memory
32 GB DDR4-3200 SDRAM [14]

Memory*
32 GB DDR4-3200 SDRAM (2 x 16 GB) [14]
16 GB DDR4-3200 SDRAM (1 x 16 GB) [14]
12 GB DDR4- 3200 SDRAM (4 GB and 8 GB (1 x 8 GB)) [14]
8 GB DDR4-3200 SDRAM (1 x 8 GB) [14]
8 GB DDR4-3200 SDRAM (2 x 4 GB) [14]
4 GB DDR4-3200 SDRAM (1 x 4 GB) [14]

Memory Slots
2 SODIMM
Both slots are accessible/upgradeable by IT or self-maintainers only
DDR4 PC4 SODIMMS, system runs at 3200
Supports Dual Channel Memory

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14. 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.
* Intel® Iris® Xe Graphics capabilities require system to be configured with Intel® Core™ i5 or i7 processors and dual channel memory

NETWORKING/COMMUNICATIONS

WLAN
Realtek 802.11ac (2x2) WLAN and Bluetooth® 5 Combo [15]
Intel® Dual Band Wireless-AC 9560 802.11a/b/g/n/ac (2x2) WLAN and Bluetooth® 5 Combo, non-vPro® [15]
Intel® Dual Band Wi-Fi® 6 AX201 802.11a/b/g/n/ac/ax (2x2) WLAN and Bluetooth® 5 Combo, non-vPro® [18]

WWAN
Intel® XMM™ 7360 LTE-Advanced (Cat9) [16]

Ethernet
Realtek 10/100/1000 GbE NIC [17]

15. Wireless access point and internet service required and sold separately. Availability of public wireless access points limited. Wi-Fi 5 (802.11 ac) is backwards compatible with prior 802.11 specs.
16. WWAN module is optional, must be configured at the factory 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.
17. 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.
18. Wireless access point and Internet service required and sold separately. Availability of public wireless access points limited. The specifications for Wi-Fi 6 (802.11ax WLAN) are draft specifications and are not final. If the final specifications differ from the draft specifications, it
may affect the ability of the notebook to communicate with other 802.11ax WLAN devices. Only available in countries where 802.11ax is supported.

AUDIO/MULTIMEDIA

Audio
2 Integrated stereo speakers
Integrated microphone (Dual Array)

Speaker Power
2W/4ohm Per speaker

Camera
720p HD Camera[8]
720p HD Camera+IR Camera [8,10]

8. HD content required to view HD images.
10. Sold separately or as an optional feature.

Not all configuration components are available in all regions/countries.
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KEYBOARDS/POINTING DEVICES/BUTTONS & FUNCTION KEYS

Keyboard
HP Premium Keyboard, spill resistant with numeric keypad and optional Durakeys and backlit

Pointing Device
Clickpad with multi-touch gesture support

Function Keys
F1 - Display Switching
F2 - Blank or SureView On/Off
F3 - Brightness Down
F4 - Brightness Up
F5 - Audio Mute
F6 - Volume Down
F7 - Volume Up
F8 - Mic Mute
F9 - Blank or Backlit Toggle
F10 - Insert
F11 - Airplane Mode
F12 - Programmable Key
Print Screen
Power Button (with LED)

Hidden Function Keys
Fn+R - Break
Fn+S - Sys Rq
Fn+C - Scroll Lock

SOFTWARE AND SECURITY

Preinstalled Software
BIOS
HP BIOSphere Gen5 [19]
HP Drive Lock & Automatic Drive Lock
BIOS Update via Network
Power On Authentication
HP Secure Erase [21]
Absolute Persistence Module [22]
HP LAN-Wireless Protection
Pre-boot Authentication

Software
Xerox® DocuShare® 90 day free trial offer[42]
HP Connection Optimizer [20]
HP Image Assistant
HP Hotkey Support
myHP
HP Noise Cancellation Software
HSA Fusion for Commercial
HSA Telemetry for Commercial
Touchpoint Customizer for Commercial
HP Notifications
HP Privacy Settings
HP System Information
HP Wireless Button Driver

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HP Power Manager
HP Work Well
Buy Office (sold separately)

Manageability Features
HP Driver Packs (download) [23]
HP Manageability Integration Kit Gen3 (download) [24]
HP System Software Manager (SSM) (download)
HP BIOS Config Utility (BCU) (download)
HP Client Catalog (download)
HP Client Management Script Library (download)

Client Security Software
HP Client Security Manager Gen6 [25]
Windows Defender [26]

Security Management
Pre-boot Authentication
USB enable/disable (via BIOS)
Power-on password (via BIOS)
Setup password (via BIOS)
HP Fingerprint Sensor [27]
Support for chassis padlocks and cable lock devices
HP Sure Click [28]
HP Sure Sense [30]
HP Sure Start Gen6 [31]
HP Sure Admin [32]
TPM 2.0 Embedded Security Chip shipped with Windows 10 (Common Criteria EAL4+ Certified)(FIPS 140-2 Level 2 Certified) [33]

19. HP BIOSphere Gen5 is available on select HP Pro and Elite PCs. See product specifications for details. Features may vary depending on the platform and configurations.
20. HP Connection Optimizer requires Windows 10.
21. HP Secure Erase For the methods outlined in the National Institute of Standards and Technology Special Publication 800-88 "Clear" sanitation method. HP Secure Erase does not support platforms with Intel® Optane™.
22. Absolute firmware module is shipped turned off and can only be activated with the purchase a license subscription and full activation of the software agent. License subscriptions can be purchased for terms ranging multiple years. Service is limited, check with Absolute for availability outside the U.S. Certain conditions apply. For full details visit: https://www.absolute.com/about/legal/agreements/absolute/
23. HP Driver Packs not preinstalled, however available for download at http://www.hp.com/go/clientmanagement.
24. HP Manageability Integration Kit can be downloaded from http://www.hp.com/go/clientmanagement.
25. HP Client Security Manager Gen6 requires Windows and is available on the select HP Pro and Elite PCs.
26. Windows Defender Opt in and internet connection required for updates.
27. HP Fingerprint sensor is an optional feature that must be configured at purchase.
28. Windows Defender Opt in and internet connection required for updates.
29. HP Sure Click requires Windows 10 Pro or Enterprise. See https://bit.ly/2PrLT6A_SureClick for complete details.
30. HP Sure Sense requires Windows 10 Pro or Enterprise.
31. HP Sure Start Gen6 is available on select HP PCs.
32. HP Sure Admin requires Windows 10, HP BIOS, HP Manageability Integration Kit from http://www.hp.com/go/clientmanagement and HP Sure Admin Local Access Authenticator smartphone app from the Android or Apple store.
33. Firmware TPM is version 2.0.
42. Simply sign up and start using Xerox® DocuShare® Go. No credit card. No obligation. Data will become unavailable unless a subscription is entered before the end of the 90 day free trial period. See visit www.xerox.com/docusharego for details.

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POWER

Power Supply [16]
HP Smart 65 W External AC power adapter [33]
HP Smart 65 W EM External AC power adapter [33]
HP Smart 65 W USB Type-C® adapter [33]
HP Smart 45 W External AC power adapter [33]
HP Smart 45 W USB Type-C® adapter [33]

Primary Battery
HP Long Life 3-cell, 45 Wh Polymer[34]

Power Cord
3-wire plug - 1m [33]
2-wire plug - 1m [33]

Battery life
Up to 12 hours and 30 minutes (UMA graphics, Intel® 11th generation CPU and 3-cell 45 WHr battery)

Battery Weight
190 g

33. Availability may vary by country.
34. Battery is internal and not replaceable by customer. Serviceable by warranty.

WEIGHTS & DIMENSIONS

Product Weight [35]
Starting at 3.83 lb
Starting at 1.74 kg

Product Dimensions (w x d x h)
35.94 x 23.39 x 1.99 cm
14.15 x 9.21 x 0.78 in

35. Weight will vary by configuration.

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PORTS/SLOTS

Ports
1 USB 3.1 Type-C® Gen 2 (Power delivery, DisplayPort™1.4)
3 USB 3.1 Gen 1 (1 charging, 1 powered port)
1 HDMI 1.4b [36]
1 RJ-45
1 Headphone/microphone combo jack
1 AC power

Expansion Slots
1 Micro SD Card Reader
Supports SD, SDHC, SDXC

36. HDMI cable sold separately.

SERVICE AND SUPPORT

HP Services offers 3-year and 1-year limited warranties and 90 day software limited warranty 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. Refer to http://www.hp.com/support/batterywarranty/ for additional battery information. On-site service and extended coverage is also available. HP Care Pack Services are 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.[37]

37. HP Care Packs are sold separately. Service levels and response times for HP Care Packs may vary depending on your geographic location. Service starts on date of hardware purchase. Restrictions and limitations apply. For details, visit http://www.hp.com/go/cpc. 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.

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SYSTEM UNIT

Stand-Alone Power Requirements (AC Power)

Nominal Operating Voltage	19 V
Average Operating Power	4.86W
Integrated graphics	Yes
Discrete Graphics	N18S-G5 : 25W
Max Operating Power	Discrete < 65W UMA < 45W

Temperature

Operating	32° to 95° F (0° to 35° C)
Non-operating	-4° to 140° F (-20° to 60° C)

Relative Humidity

Operating	10% to 90%, non-condensing
Non-operating	5% to 95%, 101.6° F (38.7° C) maximum wet bulb temperature

Shock

Operating	40 G, 2 ms, half-sine
Non-operating	200 G, 2 ms, half-sine

Random Vibration

Operating	0.75 grms
Non-operating	1.50 grms

Altitude (unpressurized)

Operating	-50 to 10,000 ft (-15.24 to 3,048 m)
Non-operating	-50 to 40,000 ft (-15.24 to 12,192 m)

Planned Industry Standard Certifications

UL	Yes
CSA	Yes
FCC Compliance	Yes
ENERGY STAR®	Select models [38]
EPEAT®	EPEAT® 2019 Gold in U.S. [39]
ICES	Yes
Australia /	Yes
NZ A – Tick Compliance	Yes
CCC	Yes
Japan VCCI Compliance	Yes
KC	Yes
BSMI	Yes
CE Marketing Compliance	Yes
BNCI or BELUS	Yes
CIT	Yes
GOST	Yes
Saudi Arabian Compliance (ICCP)	Yes

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SABS	Yes

38.Configurations of the HP ProBook 450 G8 that are ENERGY STAR® certified are identified as HP ProBook 450 G8 ENERGY STAR on HP websites and on http://www.energystar.gov.
39. Based on US EPEAT® registration according to IEEE 1680.1-2018 EPEAT®. EPEAT® status varies by country. Visit http://www.epeat.net for more information.

DISPLAYS

Note: All specifications represent the typical specifications provided by HP's component manufacturers; actual performance may vary either higher or lower.
Actual brightness will be lower with touchscreen or Sure View.

Panel LCD 15.6 inch FHD (1920x1080) Anti-Glare WLED UWVA 45% NTSC 250nits eDP 1.2 w/o PSR bent NWBZ	**Outline Dimensions (W x H x D)**	350.96 x 205.54 mm (max)
	Active Area	344.16 x 193.59 mm (typ.)
	Weight	370 g (max)
	Diagonal Size	15.6 inch
	Thickness	3.0 mm/ 5.0 mm (w/PCB) (max)
	Interface	eDP 1.2 (2 lane)
	Surface Treatment	Anti-Glare
	Touch Enabled	No
	Contrast Ratio	600:1 (typ.)
	Refresh Rate	60 Hz
	Brightness	250 nits
	Pixel Resolution	1920 x 1080 (FHD)
	Format	RGB Stripe
	Backlight	LED
	Color Gamut Coverage	NTSC 45%
	Color Depth	6 bits (Hi FRC supportive w/ condition to enable)
	Viewing Angle	UWVA 85/85/85/85

Panel LCD 15.6 inch FHD (1920x1080) Anti-Glare WLED UWVA 45% NTSC 250nits eDP 1.2 w/o PSR bent Touch on Panel NWBZ	**Outline Dimensions (W x H x D)**	350.96 x 205.74 mm (max)
	Active Area	344.16 x 193.59 mm (typ.)
	Weight	380 g (max)
	Diagonal Size	15.6 inch
	Thickness	3.2mm/ 5.2mm (PCB) (max)
	Interface	eDP 1.2
	Surface Treatment	Anti-Glare On-cell
	Touch Enabled	Yes
	Contrast Ratio	600:1 (typ.)
	Refresh Rate	60 Hz
	Brightness	250 nits
	Pixel Resolution	1920 x 1080 (FHD)
	Format	RGB Stripe
	Backlight	LED

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	Color Gamut Coverage	NTSC 45%
	Color Depth	6 bits
	Viewing Angle	UWVA 85/85/85/85

Panel LCD 15.6 inch FHD (1920x1080) Anti-Glare WLED UWVA sRGB 100% NTSC 400nits eDP 1.4+PSR2 bent LP NWBZ	**Outline Dimensions (W x H x D)**	349.46 x 204.79 mm (max)
	Active Area	344.16 x 193.59 mm (typ.)
	Weight	325 g (max)
	Diagonal Size	15.6 inch
	Thickness	2.6mm / 4.6mm (PCB) (max)
	Interface	eDP 1.4
	Surface Treatment	Anti-Glare
	Touch Enabled	No
	Contrast Ratio	1200:1 (typ.)
	Refresh Rate	60 Hz
	Brightness	400 nits
	Pixel Resolution	1920 x 1080 (FHD)
	Format	RGB Stripe
	Backlight	LED
	Color Gamut Coverage	sRGB 100%
	Color Depth	8 bit
	Viewing Angle	UWVA 85/85/85/85

Panel LCD 15.6-in FHD (1920x1080) Anti-Glare WLED UWVA 72% NTSC 1000nits eDP 1.4+PSR2 PrivacyG3 NWBZ bent	**Outline Dimensions (W x H x D)**	349.52x 205.39 mm (max)
	Active Area	344.16 x 193.59 mm (typ.)
	Weight	350 g (max)
	Diagonal Size	15.6 inch
	Thickness	2.6mm / 4.5mm Max. (PCB side)
	Interface	eDP 1.4 + PSR (4 lane)
	Surface Treatment	Anti-Glare
	Touch Enabled	No
	Contrast Ratio	2000:1 (typ.)
	Refresh Rate	60 Hz
	Brightness	1000 nits
	Pixel Resolution	1920 x 1080 (FHD)
	Format	RGB
	Backlight	LED
	Color Gamut Coverage	sRGB 100%
	Color Depth	8 bits
	Viewing Angle	UWVA 85/85/85/85

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Panel LCD 15.6-in HD (1366x768) Anti-Glare WLED SVA 45% NTSC 250nits eDP 1.2 w/o PSR NWBZ bent

Outline Dimensions (W x H x D)	350.96 x 205.54 (mm) max
Active Area	344.23 x 193.54 mm (typ.)
Weight	370 g max
Diagonal Size	15.6 inch
Thickness	3.2mm (panel) / 5.0mm (panel+PCB) max
Interface	eDP 1.2 (1 lane)
Surface Treatment	Anti-Glare
Touch Enabled	No
Contrast Ratio	300:1 (typ)
Refresh Rate	60 Hz
Brightness	250nits
Pixel Resolution	1366 x 768 (HD)
Format	RGB
Backlight	LED
Color Gamut Coverage	NTSC 45%
Color Depth	6 bits
Viewing Angle	SVA 45/45/15/35

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STORAGE AND DRIVES*

*For storage drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 30 GB (for Windows 10) is reserved for system recovery software.

SSD 128GB 2280 PCIe-3x2 Three Layer Cell		
	Form Factor	M.2 2280
	Capacity	128 GB
	NAND Type	TLC
	Height	0.09 in (2.3 mm)
	Width	0.87 in (22 mm)
	Weight	0.02 lb (10 g)
	Interface	PCIe NVMe
	Maximum Sequential Read	1400 ~ 2100 MB/s
	Maximum Sequential Write	800 ~ 1200 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

SSD 1TB 2280 PCIe-3x4 NVMe Three Layer Cell single-sided		
	Form Factor	M.2 2280
	Capacity	1 TB
	NAND Type	TLC
	Height	0.09 in (2.3 mm)
	Width	0.87 in (22 mm)
	Weight	0.02 lb (10 g)
	Interface	PCIe NVMe Gen3X4
	Maximum Sequential Read	3100 ~ 3500 MB/s
	Maximum Sequential Write	2770 ~ 3037 MB/s
	Logical Blocks	2,000,409,264
	Operating Temperature	32° to 158°F (0° to 70°C) [ambient temp]
	Features	ATA Security; TRIM; L1.2

SSD 256GB 2280 PCIe NVMe Value		
	Form Factor	M.2 2280
	Capacity	256 GB
	NAND Type	Value
	Height	0.09 in (2.3 mm)
	Width	0.87 in (22 mm)
	Weight	0.02 lb (10 g)
	Interface	PCIe NVMe Gen3
	Maximum Sequential Read	2100 ~ 2200 MB/s
	Maximum Sequential Write	900 ~ 1400 MB/s
	Logical Blocks	500,118,192
	Operating Temperature	32° to 158°F (0° to 70°C) [ambient temp]
	Features	ATA Security (optional); TRIM; L1.2

Not all configuration components are available in all regions/countries.
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SSD 512GB 2280 PCIe NVMe Value

Form Factor	M.2 2280
Capacity	512 GB
NAND Type	Value
Height	0.09 in (2.3 mm)
Width	0.87 in (22 mm)
Weight	0.02 lb (10 g)
Interface	PCIe NVMe Gen3
Maximum Sequential Read	2200 ~ 2300 MB/s
Maximum Sequential Write	1000 ~ 1600 MB/s
Logical Blocks	1,000,215,215
Operating Temperature	32° to 158°F (0° to 70°C) [ambient temp]
Features	ATA Security (optional); TRIM; L1.2

SSD 512GB 2280 PCIe-3x2x2 NVMe+SSD 32GB 3D Xpoint

Form Factor	M.2 2280
Capacity	512 GB
NAND Type	QLC+3D XPoint
Height	0.09 in (2.3 mm)
Width	0.87 in (22 mm)
Weight	0.02 lb (10 g)
Interface	PCIe NVMe Gen3X2X2
Maximum Sequential Read	Up to 2400 MB/s
Maximum Sequential Write	Up to 1300 MB/s
Logical Blocks	1,000,215,215
Operating Temperature	32° to 158°F (0° to 70°C) [ambient temp]
Features	ATA Security; TRIM; L1.2

Not all configuration components are available in all regions/countries.
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NETWORKING/COMMUNICATIONS

Intel Wi-Fi® 6[1] **AX201 + BT5 (802.11ax 2x2, non-vPro®, supporting gigabit file transfer speeds)[5]**
non-vPro ®

Wireless LAN Standards	IEEE 802.11a IEEE 802.11b IEEE 802.11g IEEE 802.11n IEEE 802.11ac IEEE 802.11ax IEEE 802.11d IEEE 802.11e IEEE 802.11h IEEE 802.11i IEEE 802.11k IEEE 802.11r IEEE 802.11v
Interoperability	Features Wi-Fi® 6 technology

Frequency Band	• 802.11b/g/n/ax
	  2.402 – 2.482 GHz
	• 802.11a/n/ac/ax
	  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

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, ,80MHz & 160MHz) • 802.11ax: MCS0 ~ MCS11, (1SS and 2SS) (20MHz, 40MHz, ,80MHz & 160MHz)
Modulation	Direct Sequence Spread Spectrum OFDM, BPSK, QPSK, CCK, 16-QAM, 64-QAM, 256-QAM, 1024QAM
Security[3]	• IEEE 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 • WAPI
Network Architecture Models	Ad-hoc (Peer to Peer) Infrastructure (Access Point Required)
Roaming	IEEE 802.11 compliant roaming between access points
Output Power[2]	• 802.11b: +18.5dBm minimum • 802.11g: +17.5dBm minimum • 802.11a: +18.5dBm minimum • 802.11n HT20(2.4GHz): +15.5dBm minimum • 802.11n HT40(2.4GHz): +14.5dBm minimum • 802.11n HT20(5GHz): +15.5dBm minimum • 802.11n HT40(5GHz): +14.5dBm minimum • 802.11ac VHT80(5GHz): +11.5dBm minimum • 802.11ac VHT160(5GHz): +11.5dBm minimum • 802.11ax HT40(2.4GHz): +10dBm minimum • 802.11ax VHT160(5GHz): +10dBm minimum

Not all configuration components are available in all regions/countries.
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Power Consumption	• Transmit mode: 2.0 W • Receive mode:1.6 W • Idle mode (PSP) 180 mW (WLAN Associated) • Idle mode: 50 mW (WLAN unassociated) • Connected Standby/Modern Standby: 10mW • Radio disabled: 8 mW
Power Management	ACPI and PCI Express compliant power management 802.11 compliant power saving mode
Receiver Sensitivity[3]	• 802.11b, 1Mbps: -93.5dBm maximum • 802.11b, 11Mbps: -84dBm maximum • 802.11a/g, 6Mbps: -86dBm maximum • 802.11a/g, 54Mbps: -72dBm maximum • 802.11n, MCS07: -67dBm maximum • 802.11n, MCS15: -64dBm maximum • 802.11ac, MCS0: -84dBm maximum • 802.11ac, MCS9: -59dBm maximum • 802.11ax, MCS11(HT40): -59dBm maximum • 802.11ax, MCS11(VHT160): -58.5dBm 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 with CNVi Interface
Dimensions	1. Type 2230: 2.3 x 22.0 x 30.0 mm 2. Type 1216: 1.67 x 12.0 x 16.0 mm
Weight	1. Type 2230: 2.8 g 2. Type 126: 1.3 g
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 Off – Radio ON

HP Integrated Module with Bluetooth 4.0/4.1/4.2/5.0/5.1 Wireless Technology

Bluetooth Specification	4.0/4.1/4.2/5.0/5.1 Compliant
Frequency Band	2402 to 2480 MHz
Number of Available Channels	Legacy: 0~79 (1 MHz/CH) BLE: 0~39 (2 MHz/CH)
Signaling Data Rate	Legacy: 3 Mbps signaling data rate* 2.17 Mbps BLE: 1 Mbps signaling data rate* 0.2 Mbps *. Actual throughput may vary. 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 + 9.5 dBm for BR and EDR.

Not all configuration components are available in all regions/countries.
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Power Consumption	Peak (Tx) 330 mW Peak (Rx) 230 mW Selective Suspend 17 mW
Bluetooth Software Supported Link Topology	Microsoft Windows Bluetooth Software
Power Management	Microsoft Windows ACPI, and USB Bus Support
Certifications	FCC (47 CFR) Part 15C, Section 15.247 & 15.249
Power Management Certifications	ETS 300 328, ETS 300 826 Low Voltage Directive IEC950 UL, CSA, and CE Mark
Bluetooth Profiles Supported	BT4.1-ESR 5/6/7 Compliance LE Link Layer Ping LE Dual Mode LE Link Layer LE Low Duty Cycle Directed Advertising LE L2CAP Connection Oriented Channels Train Nudging & Interlaced Scan BT4.2 ESR08 Compliance LE Secure Connection- Basic/Full LE Privacy 1.2 –Link Layer Privacy LE Privacy 1.2 –Extended Scanner Filter Policies LE Data Packet Length Extension FAX Profile (FAX) Basic Imaging Profile (BIP)2 Headset Profile (HSP) Hands Free Profile (HFP) Advanced Audio Distribution Profile (A2DP)

1. Wireless access point and Internet service required and sold separately. Availability of public wireless access points limited. The specifications for Wi-Fi 6 (802.11ax WLAN) are draft specifications and are not final. If the final specifications differ from the draft specifications, it
may affect the ability of the notebook to communicate with other 802.11ax WLAN devices. Only available in countries where 802.11ax is supported.
2. 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.
3. Check latest software/driver release for updates on supported security features.
4. 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).
4. Wi-Fi supporting gigabit speeds is achievable when transferring files between two devices connected to the same router. Requires a wireless router, sold separately, that supports 160MHz channels.

Intel Jefferson Peak2 9560 802.11a/b/g/n/ac (2x2) Wi-Fi and Bluetooth® 5.0 Combo[1] non-vPro®	**Wireless LAN Standards** IEEE 802.11a IEEE 802.11b IEEE 802.11g IEEE 802.11n IEEE 802.11ac IEEE 802.11d IEEE 802.11e IEEE 802.11h IEEE 802.11i IEEE 802.11k IEEE 802.11r IEEE 802.11v

Not all configuration components are available in all regions/countries.
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Interoperability	Wi-Fi® CERTIFIED modules
Frequency Band	• 802.11b/g/n 2.402 – 2.482 GHz • 802.11a/n/ac 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
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, 80MHz & 160MHz)
Modulation	Direct Sequence Spread Spectrum BPSK, QPSK, CCK, 16-QAM, 64-QAM, 256-QAM
Security[3]	• 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 • WAPI
Network Architecture Models	Ad-hoc (Peer to Peer) Infrastructure (Access Point Required)
Roaming	IEEE 802.11 compliant roaming between access points
Output Power[2]	• 802.11b: +18.5dBm minimum • 802.11g: +17.5dBm minimum • 802.11a: +18.5dBm minimum • 802.11n HT20(2.4GHz): +15.5dBm minimum • 802.11n HT40(2.4GHz): +14.5dBm minimum • 802.11n HT20(5GHz): +15.5dBm minimum • 802.11n HT40(5GHz): +14.5dBm minimum • 802.11ac VHT80(5GHz): +11.5dBm minimum • 802.11ac VHT160(5GHz): +11.5dBm minimum
Power Consumption	• Transmit mode: 2.0 W • Receive mode:1.6 W • Idle mode (PSP) 180 mW (WLAN Associated) • Idle mode: 50 mW (WLAN unassociated) • Connected Standby/Modern Standby: 10mW • Radio disabled: 8 mW
Power Management	ACPI and PCI Express compliant power management 802.11 compliant power saving mode
Receiver Sensitivity[4]	• 802.11b, 1Mbps: -93.5dBm maximum • 802.11b, 11Mbps: -84dBm maximum • 802.11a/g, 6Mbps: -86dBm maximum • 802.11a/g, 54Mbps: -72dBm maximum • 802.11n, MCS07: -67dBm maximum • 802.11n, MCS15: -64dBm maximum • 802.11ac, MCS0: -84dBm maximum • 802.11ac, MCS9: -59dBm maximum
Antenna type	High efficiency antenna with spatial diversity, mounted in the display enclosure

Not all configuration components are available in all regions/countries.

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	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 with CNVi Interface	
Dimensions	1. Type 2230: 2.3 x 22.0 x 30.0 mm 2. Type 1216: 1.67 x 12.0 x 16.0 mm	
Weight	1. Type 2230: 2.8 g 2. Type 126: 1.3 g	
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 Off – Radio ON	

HP Integrated Module with Bluetooth 4.0/4.1/4.2/5.0 Wireless Technology

Bluetooth Specification	4.0/4.1/4.2/5.0 Compliant
Frequency Band	2402 to 2480 MHz
Number of Available Channels	Legacy: 0~79 (1 MHz/CH) BLE: 0~39 (2 MHz/CH)
Signaling Data Rate	Legacy: 3 Mbps signaling data rate* throughput up to 2.17 Mbps BLE: 1 Mbps signaling data rate* throughput up to 0.2 Mbps * Actual throughput may vary. 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.
Power Consumption	Peak (Tx) 330 mW Peak (Rx) 230 mW Selective Suspend 17 mW
Bluetooth Software Supported Link Topology	Microsoft Windows Bluetooth Software
Power Management	Microsoft Windows ACPI, and USB Bus Support
Certifications	FCC (47 CFR) Part 15C, Section 15.247 & 15.249
Power Management Certifications	ETS 300 328, ETS 300 826 Low Voltage Directive IEC950 UL, CSA, and CE Mark
Bluetooth Profiles Supported	BT4.1-ESR 5/6/7 Compliance LE Link Layer Ping LE Dual Mode LE Link Layer LE Low Duty Cycle Directed Advertising LE L2CAP Connection Oriented Channels Train Nudging & Interlaced Scan BT4.2 ESR08 Compliance

Not all configuration components are available in all regions/countries.
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LE Secure Connection- Basic/Full
LE Privacy 1.2 –Link Layer Privacy
LE Privacy 1.2 –Extended Scanner Filter Policies
LE Data Packet Length Extension
FAX Profile (FAX)
Basic Imaging Profile (BIP)2
Headset Profile (HSP)
Hands Free Profile (HFP)
Advanced Audio Distribution Profile (A2DP)

1. Wireless access point and internet service required and sold separately. Availability of public wireless access points limited. Wi-Fi 6 is backwards compatible with prior 802.11 specs. The specifications for Wi-Fi 6 (802.11ax) are draft and are not final. If the final specifications differ from the draft specifications, it may affect the ability of the notebook to communicate with other 802.11ax devices. Only available in countries where 802.11ax is supported. Wi-Fi® supporting gigabit speeds is achievable when transferring files between two devices connected to the same router. Requires a wireless router, sold separately, that supports 160 MHz channels.
2. 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.
3. Check latest software/driver release for updates on supported security features.
4. 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).

Realtek RTL8822CE 802.11ac 2x2 Wi-Fi + Bluetooth® 5	**Wireless LAN Standards**	IEEE 802.11a
		IEEE 802.11b
		IEEE 802.11g
		IEEE 802.11n
		IEEE 802.11ac
		IEEE 802.11d
		IEEE 802.11e
		IEEE 802.11h
		IEEE 802.11i
		IEEE 802.11k
		IEEE 802.11r
		IEEE 802.11v
	Interoperability	Wi-Fi® CERTIFIED modules
	Frequency Band	• 802.11b/g/n 2.402 – 2.482 GHz • 802.11a/n/ac 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
	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, , 80MHz & 160MHz)
	Modulation	Direct Sequence Spread Spectrum BPSK, QPSK, CCK, 16-QAM, 64-QAM, 256-QAM
	Security[3]	• 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

Not all configuration components are available in all regions/countries.

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Technical Specifications

	• IEEE 802.11i • WAPI	
Network Architecture Models	Ad-hoc (Peer to Peer) Infrastructure (Access Point Required)	
Roaming	IEEE 802.11 compliant roaming between access points	
Output Power[2]	• 802.11b: +18.5dBm minimum • 802.11g: +17.5dBm minimum • 802.11a: +18.5dBm minimum • 802.11n HT20(2.4GHz): +15.5dBm minimum • 802.11n HT40(2.4GHz): +14.5dBm minimum • 802.11n HT20(5GHz): +15.5dBm minimum • 802.11n HT40(5GHz): +14.5dBm minimum • 802.11ac VHT80(5GHz): +11.5dBm minimum • 802.11ac VHT160(5GHz): +11.5dBm minimum	
Power Consumption	• Transmit mode: 2.0 W • Receive mode:1.6 W • Idle mode (PSP) 180 mW (WLAN Associated) • Idle mode: 50 mW (WLAN unassociated) • Connected Standby/Modern Standby: 10mW • Radio disabled: 8 mW	
Power Management	ACPI and PCI Express compliant power management 802.11 compliant power saving mode	
Receiver Sensitivity[4]	• 802.11b, 1Mbps: -93.5dBm maximum • 802.11b, 11Mbps: -84dBm maximum • 802.11a/g, 6Mbps: -86dBm maximum • 802.11a/g, 54Mbps: -72dBm maximum • 802.11n, MCS07: -67dBm maximum • 802.11n, MCS15: -64dBm maximum • 802.11ac, MCS0: -84dBm maximum • 802.11ac, MCS9: -59dBm 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	1. Type 2230: 2.3 x 22.0 x 30.0 mm 2. Type 1216: 1.67 x 12.0 x 16.0 mm	
Weight	1. Type 2230: 2.8 g 2. Type 126: 1.3 g	
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 Off – Radio ON	

HP Integrated Module with Bluetooth 4.0/4.1/4.2/5.0 Wireless Technology

Bluetooth Specification	4.0/4.1/4.2/5.0 Compliant
Frequency Band	2402 to 2480 MHz

Technical Specifications

Number of Available Channels	Legacy: 0~79 (1 MHz/CH) BLE: 0~39 (2 MHz/CH)
Signaling Data Rate	Legacy: 3 Mbps signaling data rate* throughput up to2.17 Mbps BLE: 1 Mbps signaling data rate* throughput up to 0.2 Mbps * Actual throughput may vary. 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.
Power Consumption	Peak (Tx) 330 mW Peak (Rx) 230 mW Selective Suspend 17 mW
Bluetooth Software Supported Link Topology	Microsoft Windows Bluetooth Software
Power Management	Microsoft Windows ACPI, and USB Bus Support
Certifications	FCC (47 CFR) Part 15C, Section 15.247 & 15.249
Power Management Certifications	ETS 300 328, ETS 300 826 Low Voltage Directive IEC950 UL, CSA, and CE Mark
Bluetooth Profiles Supported	BT4.1-ESR 5/6/7 Compliance LE Link Layer Ping LE Dual Mode LE Link Layer LE Low Duty Cycle Directed Advertising LE L2CAP Connection Oriented Channels Train Nudging & Interlaced Scan BT4.2 ESR08 Compliance LE Secure Connection- Basic/Full LE Privacy 1.2 –Link Layer Privacy LE Privacy 1.2 –Extended Scanner Filter Policies LE Data Packet Length Extension FAX Profile (FAX) Basic Imaging Profile (BIP)2 Headset Profile (HSP) Hands Free Profile (HFP) Advanced Audio Distribution Profile (A2DP)

1. Wireless access point and internet service required and sold separately. Availability of public wireless access points limited. Wi-Fi 6 is backwards compatible with prior 802.11 specs. The specifications for Wi-Fi 6 (802.11ax) are draft and are not final. If the final specifications differ from the draft specifications, it may affect the ability of the notebook to communicate with other 802.11ax devices. Only available in countries where 802.11ax is supported. Wi-Fi® supporting gigabit speeds is achievable when transferring files between two devices connected to the same router. Requires a wireless router, sold separately, that supports 160 MHz channels.
2. 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.
3. Check latest software/driver release for updates on supported security features.
4. Receiver sensitivity is measured at a packet error rate of 8% for 802.11b (CKK modulation) and a packet error rate of 10% for 802.11a/g (OFDM modulation).

Technical Specifications

Intel® XMM™ 7360 LTE-Advanced	**Technology/Operating bands**	FDD LTE: LTE: 2100 (Band 1), 1900 (Band 2), 1800 (Band 3), 1700 (Band 4), 850 (Band 5), 2600 (Band 7), 900 (Band 8), 1400 (Band 11), 700 (Band 12), 700 (Band 13) 700 (Band 17), 850 (Band 18), 850 (Band 19), 800 (Band 20), 1450 (Band 21), 850 (Band 26) 700 (Band 28) MHz, 700 (Band 29), 2300 (Band 30), 2100 (Band 66) MHz TDD LTE: 2600 (Band 38), 1900 (Band 39), 2300 (Band 40), 2500 (Band 41) MHz HSPA+: 2100 (Band 1), 1900 (Band 2), 1700 (Band 4), 850 (Band 5), 900 (Band 8) MHz
	Wireless protocol standards	3GPP Release 11 LTE Specification CAT.9, MAX 60MHz aggregation BW WCDMA R99, 3GPP Release 5, 6, 7 and 8 UMTS Specification
	GPS	Standalone, A-GPS (MS-B and LTO)
	GPS bands	GPS 1575.42 MHz ± 1.023 MHz, GLONASS 1596-1607MHz, Beidou 1561.098 ± 2.046 MHz
	Maximum data rates	LTE: 450 Mbps (DL 3CA), 50 Mbps (Upload) DC-HSPA+: 42 Mbps (Download), 5.76 Mbps (Upload) HSPA+: 21Mbps (Download), 5.76 Mbps (Upload)
	Maximum output power	LTE: 23 dBm HSPA+: 23.5 dBm
	Maximum power consumption	LTE: 1,200 mA (peak); 900 mA (average) HSPA+: 1,100 mA (peak); 800 mA (average)
	Form Factor	M.2, 3042-S3 Key B
	Weight	6 g
	Dimensions (Length x Width x Thickness)	42 x 30 x 2.3 mm
Realtek RTK8111EPH 10/100/1000 Integrated NIC	**Connector**	RJ-45
	System Interface	PCIe + SMBus
	Data rates supported	10 Mbit/s operation (10BASE-T; IEEE 802.3i; IEEE 802.3 clauses 13-14) 100 Mbit/s operation (100BASE-TX; IEEE 802.3u; IEEE 802.3 clauses 21-30) 1000 Mbit/s operation (1000BASE-T; IEEE 802.3ab; IEEE 8023 clauses 40) Auto-Negotiation (Automatic Speed Selection) Full Duplex Operation at all Speeds, Half Duplex operation at 10 and 100 Mbit/s
	IEEE Compliance	IEEE 802.1p QoS (Quality of Service) Support IEEE 802.1q VLAN support IEEE 802.3x Flow Control (IEEE 802.3 clauses 31-32; configurable) IEEE 802.3az EEE (Energy Efficient Ethernet)
	Performance	TCP/IP/UDP Checksum Offload (configurable) Protocol Offload (ARP & NS) Large send offload and Giant send offload Receiving Side Scaling Jumbo Frame 9K
	Power consumption	Cable Disconnetion: 25mW 100Mbps Full Run: 450mW 1000bp Full Run: 1000mW WoL Enable(S3/S4/S5): 50mW WoL Disable(S3/S4/S5): 25mW
	Power	ACPI compliant – multiple power modes

Not all configuration components are available in all regions/countries.

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Management	Situation-sensitive features reduce power consumption Advanced link down power saving for reducing link down power consumption
Management Interface	Auto MDI/MDIX Crossover cable detection
IT Manageability	Wake-on-LAN from standby and hibernation (Magic Packet and Microsoft Wake-Up Frame); Wake-on-LAN from off (Magic Packet only) PXE 2.1 Remote Boot Statistics Gathering (SNMP MIB II, Ethernet-like MIB, Ethernet MIB (802.3x, clause 30)) Comprehensive diagnostic and configuration software suite Virtual Cable Doctor for Ethernet cable status
Security & Manageability	RTK DASH support with appropriate RTK chipset components

POWER

AC Adapter 45 Watt nPFC Standard USB Type-C® Straight 1.8m	**Dimensions (H x W x D)**	94.0mm x 40.0mm x 26.5mm	
	Weight	192.5g +/-10%	
	Input	**Input Efficiency**	Average Efficiency of 25%, 50%, 75%, 100% load condition with 115Vac/230Vac Spec: 5V: 81.5% 9V: 86.7% 12V: 87.41% 15V: 87.8%
		Input frequency range	47 ~ 63 Hz
		Input AC current	Max. 1.4 A at 90 Vac
	Output	**Output power**	5V/15W 9V/27W 12V/36W 15V/45W
		DC output	5V/9V/12V/15V
		Hold-up time	5 ms at 115 Vac input
	Connector	USB Type-C®	
	Environmental Design	**Operating temperature**	32°F to 95°F (0° to 35°C)
		Non-operating (storage) temperature	-4°F to 185°F (-20° to 85°C)
		Altitude	0 to 16,400 ft (0 to 5,000 m)
		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.	

Not all configuration components are available in all regions/countries.

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AC Adapter 45 Watt Smart nPFC Standard Barrel 4.5mm Right Angle 1.8m			
	Dimensions	95 x 45 x 26.8 mm	
	Weight	200 g +/- 10 g	
	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**	45 W
		DC output	19.5 V
		Hold-up time	5 ms at 115 Vac input
		Output current limit	<8.0A
	Connector	4.5mm Barrel Type	
	Environmental Design	**Operating temperature**	32°F to 95°F (0°to 35°C)
		Non-operating (storage) temperature	-4°F to 185°F (-20°to 85°C)
		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.	

AC Adapter 45 Watt Smart nPFC Standard Barrel 4.5mm Right Angle 1.8m 2prong			
	Dimensions	95 x 45 x 26.8 mm	
	Weight	200 g +/- 10 g	
	Input	**Input Efficiency**	87.74 % at 115 Vac and 88.4 % at 230 Vac
		Input frequency range	47 ~ 63 Hz
		Input AC current	Max. 1.4 A at 90 Vac
	Output	**Output power**	45 W
		DC output	19.5 V
		Hold-up time	5 ms at 115 Vac input
		Output current limit	<8.0A
	Connector	4.5mm Barrel Type	
	Environmental Design	**Operating temperature**	32°F to 95°F (0°to 35°C)
		Non-operating (storage) temperature	-4°F to 185°F (-20°to 85°C)
		Altitude	0 to 16,400 ft (0 to 5000m)
		Humidity	20% to 95%
		Storage Humidity	10% to 95%

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	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.	
AC Adapter 65 Watt nPFC Standard USB Type-C® Straight 1.8m	**Dimensions**	90.0 x 51 x 28.5mm	
	Weight	250 g +/- 10 g	
	Input	**Input Efficiency**	81.5% min at 115 Vac/ 230Vac @ 5V/3A 86.7% min at 115 Vac/ 230Vac @ 9V/3A 88% min at 115 Vac/ 230Vac @ 12V/5A 89% min at 115 Vac/ 230Vac @ 15V/4.33A 89% min at 115 Vac/ 230Vac @ 20V/3.25A
		Input frequency range	47 ~ 63 Hz
		Input AC current	1.6 A at 90 VAC and maximum load
	Output	**Output power**	65 W
		DC output	5V/9V/12V/15V/20V
		Hold-up time	5 ms at 115 Vac input
		Output current limit	8.0A Max.
	Connector	USB Type C®	
	Environmental Design	**Operating temperature**	32°F to 95°F (0°to 35°C)
		Non-operating (storage) temperature	-4°F to 185°F (-20°to 85°C)
		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.	
AC Adapter 65 Watt Smart nPFC EM Barrel 4.5mm New EM	**Dimensions (H x W x D)**	102 x 55 x 30mm	
	Weight	250g +/-10%	
	Input	**Input Efficiency**	88.0 % at 115 Vac and 89.0 % at 230 Vac
		Input frequency range	47 ~ 63 Hz
		Input AC current	Max. 1.7 A at 90 Vac

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	Output	Output power	65W
		DC output	19.5V
		Hold-up time	5 ms at 115 Vac input
		Output current limit	<11.0A
	Connector	4.5mm Barrel Type	
	Environmental Design	Operating temperature	32°F to 95°F (0° to 35°C)
		Non-operating (storage) temperature	-4°F to 185°F (-20° to 85°C)
		Altitude	0 to 16,400 ft (0 to 5,000 m)
		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.	

AC Adapter 65 Watt Smart nPFC Standard Barrel 4.5mm Right Angle 1.8m	Dimensions (H x W x D)	90 x 51 x 28.5mm	
	Weight	230g +/-10%	
	Input	Input Efficiency	88.0 % at 115 Vac and 89.0 % at 230 Vac
		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	5 ms at 115 Vac input
		Output current limit	<11.0A
	Connector	4.5mm Barrel Type	
	Environmental Design	Operating temperature	32°F to 95°F (0° to 35°C)
		Non-operating (storage) temperature	-4°F to 185°F (-20° to 85°C)
		Altitude	0 to 16,400 ft (0 to 5,000 m)
		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.	

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Battery RH 3 Cell WHr 45 Long Life -PL Fast Charge		
Dimensions (H x W x L)	6.2 x 68.7 x 249.6mm
Weight	190g
Cells/Type	3cell Lithium-Ion Polymer cell/ 545974
Voltage	11.4 V
Amp-hour capacity	3.950Ah
Watt-hour capacity	45 Wh
Operating (Charging)	32˚ to 113˚ F (0˚ to 45˚ C)
Operating (Discharging)	14˚ to 122˚ F (-10˚ to 60˚ C)
Optional Travel Battery Available	No
Warranty	Based on system offering

Country of Origin

China

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

Type	Description	Part Number
Cases	HP Business Backpack (up to 17.3")	2SC67AA
	HP Business Case(up to 15.6")	2SC66AA
	HP Prelude Pro Recycle Backpack	1X644AA
	HP Prelude Pro Recycle Top Load	1X645AA
	HP Recycled Top Load	5KN29AA
	HP Recycled Backpack	5KN28AA
Docking	HP USB-C® Mini Dock	1PM64AA
	HP Thunderbolt Dock 120W G2	2UK37AA
	HP TB Dock G2 w/ Combo Cable	3TR87AA
	HP TB Dock 120W G2 w/Audio	3YE87AA
	HP TB Dock 120W G2 Cable	3XB94AA
	HP TB Dock G2 Combo Cable	3XB96AA
	HP TB Dock G2 Audio Module	3AQ21AA
	HP USB-C/A Universal Dock G2	5TW13AA
	HP USB-C Dock G5	5TW10AA
Input/Output	HP USB Essential Keyboard and Mouse	H6L29AA
	HP Wired Desktop 320MK Mouse & Keyboard	9SR36AA
	HP Bluetooth Travel Mouse	6SP30AA
	HP Comfort Grip Wireless Mouse	H2L63AA
	HP Wired Desktop 320M Mouse	9VA80AA
	HP USB Travel Mouse	G1K28AA
	HP Elite USB-C Hub	4WX89AA
	HP USB-C Travel Hub G2	7PJ38AA
	HP USB-C to RJ45 Adapter	V7W66AA
	HP USB-C to USB 3.0 Adapter	N2Z63AA
	HP USB-C to HDMI 2.0 Adapter	1WC36AA
	HP Stereo USB Headset	T1A67AA
	HP Stereo 3.5mm Headset	T1A66AA
Power	HP 45W Smart AC Adapter 4.5mm	H6Y88AA
	45W Smart Power Adapter 2 prong -4.5mm (Japan only)	L6F60AA
	65W Smart Power Adapter (w/ 4.5mm to 7.5mm DC dongle)	H6Y89AA
	HP 65W Slim AC Adapter	H6Y82AA
	HP 65W USB-C Slim Power Adapter	3PN48AA
	HP 45W LC USB-C Power Adapter	1MZ01AA
	HP 65W USB-C LC Power Adapter	TBD
	HP Power Bank	N9F71AA
	HP USB-C Notebook Power Bank	3TB55AA
Storage	HP External USB Optical Drive	F2B56AA

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

Security	HP Sure Key Cable Lock	6UW42AA
	HP Nano Keyed Cable Lock	1AJ39AA

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Summary of Changes

Date of change:	Version History:		Description of change:
	V1 to V2		

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