HP ZBook Firefly 14 Inch G8 Mobile Workstation

Right

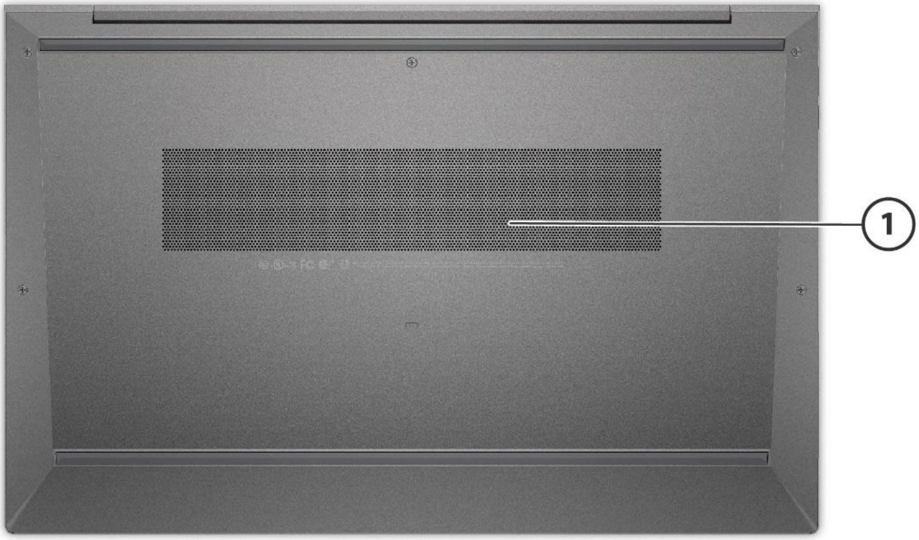
1. 4.5mm AC Power connector
2. Battery Charging LED
3. HDMI 2.0 (HDMI cable not included)
4. (2) USB Type-C® with Thunderbolt™ 4
5. Nano SIM card slot (optional)[1]
6. Speakers
7 Clickpad
8. Dual point stick with buttons
9. HP Premium Keyboard
10. HD Camera (select models only)
11. IR Camera (select models only)
12. HP Privacy Camera Shutter
13. Multi array microphone
14. Webcam LED
15. Power button (on keyboard)
16. Fingerprint sensor (optional)

[1] All units have a SIM card slot and icon but units that do not support WWAN are shipped with a non-removable SIM slot plug

Overview

Left

1. Nano security lock slot (cable lock sold separately)
2. (1) USB 3.1 Gen 1 Type A charging port
3. (1) USB 3.1 Gen 1 Type A
4. Headphone/microphone combo jack
5. HP Smart Card Reader (optional)



Bottom

1. Fan Venting

At A Glance

- Work anywhere without compromising on performance or security with Windows 10 Pro[1], powered by HP's collaboration and connectivity technology.
- Open large files and run apps simultaneously for speedy multitasking and productivity with the next generation NVIDIA® T500 graphics with 4GB of video memory.
- Bring your ideas to life quickly and effectively with the latest 11th gen quad core Intel® Core™ processors[2] with up to 4.7 GHz of acceleration when you need it most.[3]
- Strenuously tested to meet ISV certification and deliver superb performance and support with leading software providers, including Autodesk.[4]
- Instantly protect against visual hacking with HP Sure View Reflect6 and defend against firmware and malware attacks with HP Sure Start Gen6[7], HP Sure Sense[8], and HP Tamper Lock[9] intrusion detection sensor.
- Built with the environment in mind, this ZBook includes recycled ocean-bound plastics[10], plastic-free packaging, a reduction in hazardous material and ultra-efficient power consumption.
- The keyboard has been re-imagined with rubber domes, power button, and a quiet clickpad for a more comfortable, intuitive, and quiet experience.
- Choice of modern viewing experiences:
    - 14" diagonal, FHD (1920 x 1080), IPS, anti-glare, 400 nits, low power 100% sRGB
    - 14" diagonal, FHD (1920 x 1080), IPS, anti-glare, 250 nits, 45% NTSC
    - 14" diagonal, FHD (1920 x 1080), IPS, anti-glare, 1000 nits, 72% NTSC, HP Sure View Reflect integrated privacy screen
    - 14" diagonal, FHD (1920 x 1080), IPS, anti-glare, 500 nits, 100% DCI-P3, HP DreamColor panel
    - 14" diagonal, FHD (1920 x 1080), touch, IPS, anti-glare, 250 nits 100% sRGB
- Designed for ultimate durability, this ZBook undergoes 19 brutal MIL-STD 810H [11] tests to help ensure this PC keeps rolling through your workday.
- Plug in to greater connectivity at your desktop with the HP Thunderbolt Dock for lightning-fast Thunderbolt™ 3[12] transfers and the flexibility to run up to two external 4K displays.[13,14]
- Work without limits in any location with up to 2TB[15] of local PCIe storage.
- 170 degree clamshell hinges lay almost flat, for easy collaboration and comfortable viewing at every angle.
- No need to risk riding someone else's network when you have your own. Optional 4G LTE[16] or 5G[18] leverages the SIM card from your wireless provider for enhanced security.
- A completely revamped standby system means you're ready to work the moment inspiration strikes. With no sleep mode and no off mode, the modern standby keeps your rig connected and on demand whenever you need it.
- Improve connectivity while on Wi-Fi® with HP Extended Range Wireless LAN that allows greater distance from
- transmission point and fast data throughput at shorter ranges.[17]

[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] 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.
[3] Intel® Turbo Boost technology requires a PC with a processor with Intel Turbo Boost capability. Intel Turbo Boost performance varies depending on hardware, software and overall system configuration. See www.intel.com/technology/turboboost for more information.
[4] Autodesk software sold separately.
[6] HP Sure View Reflect integrated privacy screen is an optional feature that must be configured at purchase and operates in landscape orientation.
[7] HP Sure Start Gen6 is available 2021 on select HP PCs and requires Windows 10.
[8] HP Sure Sense requires Windows 10 Pro or Enterprise. See product specifications for availability.
[10] Speaker enclosure component made with 5% ocean bound plastic as of 2/3/2020.
[11] Testing is not intended to demonstrate fitness of U.S. Department of Defense (DoD) contract requirements or for military use.

Overview

Test results are not a guarantee of future performance under these test conditions. Accidental damage requires an optional HP Accidental Damage Protection Care Pack.

[12] HP Thunderbolt Dock with Thunderbolt™ 3 (120Wsold separately.

[13] External displays sold separately.

[14] Optional hybrid graphics is required to run up to two external 4K displays.

[15] For hard drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 30GB (for Windows 10) of system disk is reserved for system recovery software.

[16] 4G LTE requires separately purchased service contract, and configuration at purchase. 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] Based on internal testing vs. previous generation product with 802.11ac wireless LAN module.

[18] WWAN modules for 5G ready platforms are optional features that can be configured at purchase or added later by the customer. 5G module supports AT&T and T-Mobile networks in the U.S. Module designed for 5G networks as carriers deploy Evolved-Universal Terrestrial Radio Access New Radio Dual Connectivity (ENDC) with both 100Mhz of 5G NR and LTE channel bandwidth, using 256QAM 4x4 as defined by 3GPP, requires activation and separately purchased service contract. Check with service provider for coverage and availability in your area. Connection, upload and download speeds will vary due to network, location, environment, network conditions, and other factors. 5G not available on all products, in all regions. Backwards compatible to 4G LTE and 3G HSPA technologies. 5G module planned to be available in select countries, where carrier supported.

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

OPERATING SYSTEM

Preinstalled OS	Windows 10 Pro 64 - HP recommends Windows 10 Pro for business.[1] Windows 10 Home 64[1] Windows 10 Home Single Language 64[1] Windows 10 Pro 64 [1] FreeDOS 3.0
Web support OS	Windows 10 Enterprise 64[1]
Supported Version	For testing information on newer versions of Windows 10, please see: https://support.hp.com/document/c05195282.

[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] Tested and documented only.

Note: 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.

PROCESSOR

11th Generation Intel® Core™ i7-1185G7 (3 GHz base frequency, up to 4.80 GHz with Intel® Turbo Boost Technology, 12 MB cache, 4 cores) [1,2,3,4]

11th Generation Intel® Core™ i7-1165G7 (2.80 GHz base frequency, up to 4.70 GHz with Intel® Turbo Boost Technology, 12 MB cache, 4 cores) [1,2,3,4]

11th Generation Intel® Core™ i5-1145G7 (2.60 GHz base frequency, up to 4.40 GHz with Intel® Turbo Boost Technology, 8 MB cache, 4 cores) [1,2,3,4]

11th Generation Intel® Core™ i5-1135G7 (2.40 GHz base frequency, up to 4.20 GHz with Intel® Turbo Boost Technology, 8 MB cache, 4 cores) [1,2,3,4]

[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, branding and/or naming is not a measurement of higher performance.

[2] Processor speed denotes maximum performance mode; processors will run at lower speeds in battery optimization mode.

[3] Intel® Turbo Boost performance varies depending on hardware, software and overall system configuration. See www.intel.com/technology/turboboost for more information.

[4] 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.

CHIPSET

Integrated in System on Chip (SOC)

GRAPHICS

Integrated

Intel® Iris® Xe Graphics [1, 3, 5, 6]

Discrete

NVIDIA® T500 (4 GB GDDR6 dedicated)[2, 4]

[1] UHD content required to view UHD images.

[2] Both UMA & Discrete configurations support 3 independent displays when on the HP Thunderbolt Dock G2 (120W) (sold separately) - Max. resolution = 2.5K @60Hz (DP1) & 2.5K @60Hz (DP2) & FHD (VGA) OR 4K @60Hz (one DP Port) & 4K @60Hz (Type-C output port using a Type C-to-DP adapter).

[3] Support HD decode, DX12, HDMI 2.0b, HDCP 2.3 via DP up to 4K @ 60Hz and via HDMI up to 4096x2304 @ 60Hz

[4] HDMI cable Sold Separately

[5] Shared video memory (UMA) uses part of the total system memory for video performance. System memory dedicated to video performance is not available for other use by other programs.

[6] Intel® Iris® Xe Graphics capabilities require system to be configured with Intel® Core™ i5 or i7 processors and dual channel memory. Intel® Iris® Xe Graphics with Intel® Core™ i5 or 7 processors and single channel memory will only function as UHD graphics.

DISPLAY

Non-touch

- 14" diagonal, FHD (1920 x 1080), IPS, anti-glare, 400 nits, low power 100% sRGB [3,4]
- 14" diagonal, FHD (1920 x 1080), IPS, anti-glare, 250 nits, 45% NTSC [3,4]
- 14" diagonal, FHD (1920 x 1080), IPS, anti-glare, 1000 nits, 72% NTSC, HP Sure View Reflect integrated privacy screen [1,3,4,5]
- 14" diagonal, FHD (1920 x 1080), IPS, anti-glare, 500 nits, 100% DCI-P3, HP DreamColor panel[,3,4,6]

Touch

- 14" diagonal, FHD (1920 x 1080), touch, IPS, anti-glare, 250 nits, 45% NTSC [3,4,5]

[1] HP Sure View Reflect is optional and must be configured at purchase.

[3] Sold separately or as an optional feature.

[4] Resolutions are dependent upon monitor capability, and resolution and color depth settings.

[5] Actual brightness will be lower with HP Sure View Reflect or touch screen.

[6] HP DreamColor display available in 2Q of 2021.

Features

STORAGE AND DRIVES*

PCIe® NVMe™ M.2 2280 Storage
256 GB PCIe® Gen3 x4 NVMe™ M.2 2280 TLC Self Encrypting (SED) Solid State Drive (SSD)
512 GB PCIe® Gen3 x4 NVMe™ M.2 2280 TLC Self Encrypting (SED) Solid State Drive (SSD)
256 GB PCIe® Gen3 x4 NVMe™ M.2 2280 TLC Solid State Drive (SSD)
512 GB PCIe® Gen3 x4 NVMe™ M.2 2280 TLC Solid State Drive (SSD)
1 TB PCIe® Gen3 x4 NVMe™ M.2 2280 TLC Solid State Drive (SSD)
2 TB PCIe® Gen3 x4 NVMe™ M.2 2280 TLC Solid State Drive (SSD)
256 GB PCIe® Gen3 x4 NVMe™ M.2 2280 TLC Value Solid State Drive (SSD)
128 GB PCIe® Gen3 x2 NVMe™ M.2 2280 TLC Solid State Drive (SSD)

Intel® Optane™ Memory H10 with Solid State Storage
512 GB PCIe® Gen3 x4 NVMe™ M.2 2280 QLC Solid State Drive (SSD) + 32 GB Intel® Optane™ Memory[1,2]

[2] Intel® Optane™ memory system acceleration does not replace or increase the DRAM in your system.

* For storage drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 35GB of disk is reserved for system recovery software.

DRIVE CONTROLLERS

M.2 Storage Bay (PCIe NVMe)	PCIe® Gen3 x4 lanes NVMe™ Solid State Drive
RAID:	Not supported

MEMORY

Maximum Memory for configuration without discrete graphics
64 GB DDR4-3200 non-ECC SDRAM[1]
2 DDR4 SODIMMS
Supports Dual Channel Memory[3]

Maximum Memory for configuration with discrete graphics
32 GB DDR4-3200 non-ECC SDRAM [2]
Memory soldered Down
Supports Dual Channel Memory

[1] 64GB memory configurations is only available on configurations without discrete graphics.
[2] Soldered down memory is a requirement on configurations that have discrete graphics.
[3] 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

WLAN

Intel® Wi-Fi 6 AX201 (2x2) and Bluetooth® 5 combo, non-vPro® [1]

[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.

WWAN*

Intel® XMM™ 7360 LTE Advanced CAT 9[1]
Qualcomm® Snapdragon™ X55 5G Modem[2]

[1] WWAN is an optional feature and requires factory configuration with the appropriate panel (identified at point of purchase) and 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, and in all regions.

*WWAN capabilities can be configured at the time of purchase by select a panel that indicates it is “for WWAN”. “For WWAN” panels include the antenna required to support the 4G LTE or 5G module. The 4G LTE or 5G module does not need to be selected at the time of purchase; furthermore, the supported 4G LTE or 5G module can be purchased at a later time and the unit can be upgraded with the 4G LTE or 5G module at a later time.

[2] 5G module is an optional feature that must be configured at purchase. AT&T and T-Mobile networks supported in the U.S. Module designed for 5G networks as carriers deploy Evolved-Universal Terrestrial Radio Access New Radio Dual Connectivity (ENDC) with both 100Mhz of 5G NR and LTE channel bandwidth, using 256QAM 4x4 as defined by 3GPP, requires activation and separately purchased service contract. Check with service provider for coverage and availability in your area. Connection, upload and download speeds will vary due to network, location, environment, network conditions, and other factors. 5G not available on all products, in all regions. Backwards compatible to 4G LTE and 3G HSPA technologies. 5G module planned to be available in select countries, where carrier supported.

Optional Near Field Communication (NFC) module

AUDIO/MULTIMEDIA

Audio

Audio by Bang & Olufsen, dual stereo speakers, HP World Facing Microphone dual array digital microphone, functions keys for volume up and down, combo microphone/headphone jack, HD audio

Camera[1, 2]

720p HD webcam with IR
720p HD webcam

[1] HD content required to view HD images.

[2] Windows Hello face authentication utilizes a camera specially configured for near infrared (IR) imaging to authenticate and unlock Windows devices as well as unlock your Microsoft Passport.

KEYBOARDS/POINTING DEVICES/BUTTONS & FUNCTION KEYS

Keyboard
HP Premium Quiet Keyboard, full-size, spill-resistant, backlit, with DuraKeys, clickpad with image sensor and glass surface, multi-touch gestures and taps enabled
HP Premium Quiet Keyboard, full-size, spill-resistant, with DuraKeys, clickpad with image sensor and glass surface, multi-touch gestures and taps enabled

Pointing Devices
Dual pointstick; Clickpad with multi-touch gestures enabled, taps enabled as default; Microsoft Precision Touchpad Default Gestures Support

SOFTWARE AND SECURITY

Software
Bing search for IE11
Buy Office
HP Hotkey Support
HP Noise Cancellation Software
HP Performance Advisor (download only)[9]
HP Recovery Manager
HP ZCentral Remote Boost Software (download only)[2]
HP Support Assistant [1]
Native Miracast support [5]
HP Connection Optimizer[10]
HP PC Hardware Diagnostics UEFI
HP PC Hardware Diagnostics Windows
HP Privacy Settings
HP Programmable Key
HP QuickDrop[21]
HP Touchpoint Customizer
HP WorkWell
myHP
Tile™ [22]

Security Management
Absolute persistence module [7]
HP Device Access Manager
HP FingerPrint Sensor
HP Manageability Integration Kit SCCM Gen6[12]
HP Power On Authentication
HP Support Assistant[8]
Nano Security lock slot[13]
Trusted Platform Module TPM 2.0 Embedded Security Chip
Master Boot Record security
Pre-boot authentication
Microsoft Defender[11]
HP Client Security Manager Gen7 [18]
HP BIOSphere Gen6[6]
HP Sure Recover Gen4[14]
HP Sure Recover with Embedded Reimaging Gen4[15]
HP Sure Start Gen7[6, 16]
HP Secure Erase [17]
HP Sure Sense[19]
HP Sure Admin[23]
HP Sure Click

Features

HP Sure Run Gen3
HP Sure View Reflect
HP Image Assistant Gen4.6
HP Proactive Security (DaaS)
MS Bitlocker Encryption
Self-Encrypting Drives
HP Tamper Lock
HP TPM Configuration Utility
Secured-core PC capable[20]

Fingerprint reader (select models)

For more information on HP Client Security Software Suite, refer to http://www.hp.com/go/clientsecurity.

[1] HP Support Assistant - Requires Windows and Internet Access.
[2] HP ZCentral Remote Boost does not come preinstalled on Z Workstations but can be downloaded and run on all Z desktop and laptops without license purchase. With non-Z sender devices, purchase of perpetual individual license or perpetual floating license per simultaneously executing versions and purchase of ZCentral Remote Boost Software Support is required. RGS requires Windows, RHEL (7 or 8), UBUNTU 18.04 LTS, or HP ThinPro 7 operating systems. MacOS (10.13 or newer) operating system is only supported on the receiver side. Requires network access. The software is available for download at hp.com/ZCentralRemoteBoost.
[5] Miracast is a wireless technology your PC can use to project your screen to TVs, projectors, and streaming media players that also support Miracast. You can use Miracast to share what you're doing on your PC and present a slide show. For more information: http://windows.microsoft.com/en-us/windows-8/project-wireless-screen-miracast.
[6] HP BIOSphere Gen6 is available on select HP Pro, Elite and ZBook PCs. See product specifications for details. Features may vary depending on the platform and configurations.
[7] Absolute agent is shipped turned off, and will be activated when customers activate a purchased subscription. Subscriptions can be purchased for terms ranging multiple years. Service is limited, check with Absolute for availability outside the U.S. The Absolute Recovery Guarantee is a limited warranty. Certain conditions apply. For full details visit: http://www.absolute.com/company/legal/agreements/computrace-agreement. Data Delete is an optional service provided by Absolute Software. If utilized, the Recovery Guarantee is null and void. In order to use the Data Delete service, customers must first sign a Pre-Authorization Agreement and either obtain a PIN or purchase one or more RSA SecurID tokens from Absolute Software.
[9] HP Performance Advisor Software - HP Performance Advisor is ready and waiting to help you get the most out of your HP Workstation from day one—and every day after. Learn more or download at: https://www8.hp.com/us/en/workstations/performance-advisor.html
[10] HP Connection Optimizer requires Windows 10.
[11] Microsoft Defender Opt in and internet connection required for updates.
[12] HP Manageability Integration Kit can be downloaded from http://www.hp.com/go/clientmanagement.
[13] Nano Security lock slot is Lock sold separately.
[14] HP Sure Recover Gen4: See product specifications for availability. Requires an open, wired network connection. You must back up important files, data, photos, videos, etc. before using HP Sure Recover to avoid loss of data.
[15] HP Sure Recover with Embedded Reimaging Gen3 is an optional feature which must be configured at purchase with a base unit that has the On System Recovery (OSR) module . See product specifications for availability You must back up important files, data, photos, videos, etc. before use to avoid loss of data. HP Sure Recover with Embedded Reimaging (Gen1) does not support platforms with Intel® Optane™.
[16] HP Sure Start Gen6 is available on select HP PCs with Intel processors. See product specifications for availability.
[17] 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™.
[18] HP Client Security Manager Gen7 requires Windows and is available on select HP Pro, Elite and ZBook PCs. See product specifications for details.
[19] HP Sure Sense requires Windows 10. See product specifications for availability.
[20] Secured-core PC requires an Intel® vPro® or AMD Ryzen™ Pro processor. Requires 8 GB or more system memory. Secured-core PC functionality can be enabled from the factory.
[21] Requires Internet access and Windows 10 PC preinstalled with HP QuickDrop app and either an Android device (phone or tablet) running Android 7 or higher with the Android HP QuickDrop app, and /or an iOS device (phone or tablet) running iOS 12 or higher with the iOS HP QuickDrop app.
[22] Some features require optional subscription to Tile Premium. Tile application for Windows 10 available for download from the Windows Store. Mobile phone app available for download from App Store and Google Play. Requires iOS 11 and greater or Android 6.0 and greater see https://support.thetileapp.com/hc/en-us/articles/200424778 for more information. HP Tile will function as long as the PC has battery power.

[23] 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.

POWER

Power Supply

Up to 14 hours[1]

HP Long Life 3-cell, 53 Wh Li-ion polymer[2,4]

HP Smart 65 W External AC Power Adapter[3]
HP Smart 45 W External AC Power Adapter

Supports battery fast charge: approximately 50% in 30 minutes

[1] Battery life will vary depending on the 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 MobileMark18 battery benchmark https://bapco.com/products/mobilemark-2018/ for additional details.

[2] Supports HP Fast Charge Technology

[3] 45W Power Adapter is not available with Discrete Graphics Configurations.

[4] Actual battery Watt-hours (Wh) will vary from design capacity. Battery capacity will naturally decrease with shelf life, time, usage, environment, temperature, system configuration, loaded apps, features, power management settings and other factors.

ENVIRONMENTAL

ENERGY STAR® certified and EPEAT® Gold registered configurations available [1]

Low halogen[2]

[1] Based on US EPEAT® registration according to IEEE 1680.1-2018 EPEAT®. Status varies by country. Visit www.epeat.net for more information.

[2] External power supplies, power cords, cables and peripherals are not low halogen. Service parts obtained after purchase may not be low halogen.

WEIGHTS & DIMENSIONS

Dimensions (w x d x h)
32.3 x 21.46 x 1.79 cm
12.73 x 8.45 x 0.71 in

Weights
Starting at 1.35kg (2.98 lb)
Weight varies by configuration and components.

PORTS/SLOTS

Left side
1 headphone/microphone combo
1 SuperSpeed USB Type-A 5Gbps signaling rate [USB 3.1 Gen 1 Type A]
1 SuperSpeed USB Type-A 5Gbps signaling rate (charging) [USB 3.1 Gen 1 Type A charging]
1 Smart card reader (optional)

Right side
1 4.5mm AC power connector
1 HDMI 2.0b
2 Thunderbolt™ 4 with USB4™ Type-C® 40Gbps signaling rate* (USB Power Delivery, DisplayPort™ 1.4, HP Sleep and Charge**) [USB Type-C® with Thunderbolt™ 4]
1 SIM Card Slot (optional)

*SuperSpeed USB 20Gbps signaling rate is not available directly from the port.
*HP Sleep and Charge requires USB Type-A/Type-C charging protocol standard cable or dongle with external device for full functionality.

SERVICE AND SUPPORT

3-year limited warranty options available, depending on country. Batteries have a default one-year limited warranty except for Long Life Batteries which will have same 1-year or 3-year limited warranty as the platform. Optional[1] HP Care Pack Services are extended service contracts which go beyond your standard limited warranties. To choose the right level of service for your HP product, use the HP Care Pack Services Lookup Tool at http://www.hp.com/go/cpc.

[1] Sold separately or as an optional feature. Service levels and response times for HP Care Packs may vary depending on your geographic location. Service starts on date of hardware purchase. Restrictions and limitations apply. HP services are governed by the applicable HP terms and conditions of service provided or indicated to Customer at the time of purchase. Customer may have additional statutory rights according to applicable local laws, and such rights are not in any way affected by the HP terms and conditions of service or the HP Limited Warranty provided with your HP Product. Consult your local HP Customer Support Center for details.

SYSTEM UNIT

Stand-Alone Power Requirements (AC Power)	**Nominal Operating Voltage**	19.5V	
	Average Operating Power(idle)	**WIN10**	System in idle mode UMA 2.3W DIS 2.6W
	Integrated graphics	Yes	
	Discrete Graphics	Yes	
	Max Operating Power	Discrete < 65W UMA < 45W	
Temperature	**Operating**	32° to 95° F (0° to 35° C)	
	Non-operating	41° to 95° F (5° to 35° C) (writing optical)	
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	
Maximum 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[1]	
	EPEAT®	EPEAT® Gold in United States [2]	
	ICES	Yes	
	Australia / NZ A-Tick Compliance	Yes	
	CCC	Yes	
	Japan VCCI Compliance	Yes	
	KCC	Yes	
	BSMI	Yes	
	CE Marking Compliance	Yes	
	MIL STD 810H	Yes, 19 tests	
	BNCI or BELUS	Yes	
	CIT	Yes	
	GOST	Yes	
	Saudi Arabian Compliance (ICCP)	Yes	
	SABS	Yes	

[1] Configurations of the HP ZBook Firefly 14 Inch G8 Mobile Workstation that are ENERGY STAR® qualified are identified as HP ZBook Firefly 14 Inch G8 Mobile Workstation ENERGY STAR on HP websites and on http://www.energystar.gov.

[2] Based on US EPEAT® registration according to IEEE 1680.1-2018 EPEAT®. Status varies by country. Visit www.epeat.net for more information.

DISPLAYS

14" diagonal, FHD (1920 x 1080), IPS, anti-glare, 250 nits, 45% NTSC	**Outline Dimensions** (W x H)	316.17 x 186.4 mm (max) (w/ PCB)	
	Active Area	309.37 x 174.02 mm (typ.)	
	Weight	300 g (max)	
	Diagonal Size	14.0 inch	
	Thickness	3.0 mm/ 5.0 mm (PCB) (max)	
	Interface	eDP 1.2	
	Surface Treatment	Anti-Glare	
	Touch enabled	No	
	Contrast Ratio	600:1 (typ.)	
	Refresh Rate	60 Hz	
	Brightness	250 nits	
	Pixel Resolution	**Pitch**	1920 x 1080 (FHD)
		Format	RGB Stripe
	Backlight	LED	
	PPI	157	
	Color Gamut Coverage	NTSC 45%	
	Color Depth	6 bits (Hi FRC supportive w/ condition to enable)	
	Viewing Angle	UWVA 85/85/85/85	
14" diagonal, FHD (1920 x 1080), touch, IPS, anti-glare, 250 nits, 45% NTSC	**Outline Dimensions** (W x H)	316.17 x 186.4 mm (max) (w/ PCB)	
	Active Area	309.37 x 174.02 mm (typ.)	
	Weight	305 g (max)	
	Diagonal Size	14.0 inch	
	Thickness	3.0 mm/ 5.0 mm (PCB) (max)	
	Interface	eDP 1.2	
	Surface Treatment	Anti-Glare On-cell touch	
	Touch enabled	Yes	
	Contrast Ratio	600:1 (typ.)	
	Refresh Rate	60 Hz	
	Brightness	250 nits*	
	Pixel Resolution	**Pitch**	1920 x 1080 (FHD)
		Format	RGB Stripe
	Backlight	LED	
	PPI	157	
	Color Gamut Coverage	NTSC 45%	
	Color Depth	6 bits (Hi FRC supportive w/ condition to enable)	
	Viewing Angle	UWVA 85/85/85/85	

*Actual brightness will eb lower with Sure View or touchscreen.

Technical Specifications – Displays

14" diagonal, FHD (1920 x 1080), IPS, anti-glare, 400 nits, low power, 100% sRGB	**Outline Dimensions** (W x H)	315.07 x 186.6 mm (max)	
	Active Area	309.37 X 174.02 mm (typ.)	
	Weight	200 g (max)	
	Diagonal Size	14.0 inch	
	Thickness	2.0 mm/4.0 mm (w/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	**Pitch**	1920 x 1080 (FHD)
		Format	RGB Stripe
	Backlight	LED	
	PPI	157	
	Color Gamut Coverage	sRGB 100% (NTSC 72%)	
	Color Depth	8 bits	
	Viewing Angle	UWVA 85/85/85/85	

14" diagonal, FHD (1920 x 1080), IPS, anti-glare, 1000 nits, 72% NTSC, HP Sure View Reflect integrated privacy screen	**Outline Dimensions (W x H)**	314.612 x 185.33 mm (max.)	
	Active Area	309.312 x 173.99 mm	
	Weight	230 g (max.)	
	Diagonal Size	14.0”	
	Thickness	3.9 mm (max.)	
	Interface	eDP 1.4 + PSR	
	Panel Technology	IPS	
	Surface Treatment	Anti-glare (AG)	
	Touch Enabled	No	
	Contrast Ratio	1500:1 (typ.)	
	Refresh Rate	60 Hz	
	Brightness	1000 nits*	
	Pixel Resolution	**Pitch**	1920 x 1080 (FHD)
		Format	RGB
	Backlight	LED	
	PPI	157	
	Color Gamut Coverage	100% sRGB	
	Color Depth	8 bits	
	Viewing Angle	UWVA 85/85/85/85	

*Actual brightness will eb lower with Sure View or touchscreen.

STORAGE AND DRIVES

128 GB PCIe® Gen3 x2 NVMe™ M.2 2280 TLC Solid State Drive (SSD)	**Form Factor**	M.2 2280	
	Drive Weight	0.02 lb (10 g)	
	Capacity	128 GB	
	NAND Type	TLC	
	Height	0.09 in (2.3 mm)	
	Width	0.87 in (22 mm)	
	Interface	PCIe® Gen3 x2 NVMe™	
	Performance	**Maximum Sequential Read**	**Maximum Sequential Write**
		Up to 1400 ~ 2100 MB/s	Up to 800 ~ 1200 MB/s
	Logical Blocks	250,069,680	
	Operating Temperature	32° to 158°F (0° to 70°C) [ambient temp]	
	Features	ATA Security (Option); TRIM; L1.2	
		Note: For storage drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 35 GB (for Windows 10) is reserved for system recovery software.	
1 TB PCIe® Gen3 x4 NVMe™ M.2 2280 TLC Solid State Drive (SSD)	**Form Factor**	M.2 2280	
	Drive Weight	0.02 lb (10 g)	
	Capacity	1 TB	
	NAND Type	TLC	
	Height	0.09 in (2.3 mm)	
	Width	0.87 in (22 mm)	
	Interface	PCIe® Gen3 x4 NVMe™	
	Performance	**Maximum Sequential Read**	**Maximum Sequential Write**
		Up to 3100 ~ 3500 MB/s	Up to 2700 ~ 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	
		Note: For storage drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 35 GB (for Windows 10) is reserved for system recovery software.	
256 GB PCIe® Gen3 x4 NVMe™ M.2 2280 TLC Solid State Drive (SSD)	**Form Factor**	M.2 2280	
	Drive Weight	0.02 lb (10 g)	
	Capacity	256 GB	
	NAND Type	TLC	
	Height	0.09 in (2.3 mm)	
	Width	0.87 in (22 mm)	
	Interface	PCIe® Gen3 x4 NVMe™	
	Performance	**Maximum Sequential Read**	**Maximum Sequential Write**
		Up to 2800 ~ 3500 MB/s	Up to 1600 ~ 2200 MB/s
	Logical Blocks	500,118,192	
	Operating Temperature	32° to 158°F (0° to 70°C) [ambient temp]	
	Features	ATA Security; TRIM; L1.2	

		Note: For storage drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 35 GB (for Windows 10) is reserved for system recovery software.	
256 GB PCIe® Gen3 x2 NVMe™ M.2 2280 TLC Value Solid State Drive (SSD)	**Form Factor**	M.2 2280	
	Drive Weight	0.02 lb (10 g)	
	Capacity	256 GB	
	NAND Type	Value TLC	
	Height	0.09 in (2.3 mm)	
	Width	0.87 in (22 mm)	
	Interface	PCIe® NVMe™ Gen3 x2	
	Performance	**Maximum Sequential Read**	**Maximum Sequential Write**
		Up to 2100 ~ 2400 MB/s	Up to 950 ~ 1400 MB/s
	Logical Blocks	500,118,192	
	Operating Temperature	32° to 158°F (0° to 70°C) [ambient temp]	
	Features	ATA Security (Option); TRIM; L1.2	
		Note: For storage drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 35 GB (for Windows 10) is reserved for system recovery software.	
256 GB PCIe® Gen3 x4 NVMe™ M.2 2280 TLC Self Encrypting (SED) Solid State Drive (SSD)	**Form Factor**	M.2 2280	
	Drive Weight	0.02 lb (10 g)	
	Capacity	256 GB	
	NAND Type	TLC	
	Height	0.09 in (2.3 mm)	
	Width	0.87 in (22 mm)	
	Interface	PCIe® Gen3 x4 NVMe™	
	Performance	**Maximum Sequential Read**	**Maximum Sequential Write**
		Up to 2800 ~ 3500 MB/s	Up to 1663 ~ 2200 MB/s
	Logical Blocks	500,118,192	
	Operating Temperature	32° to 158°F (0° to 70°C) [ambient temp]	
	Features	ATA Security (Option); TCG Opal 2.0; TRIM; L1.2	
		Note: For storage drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 35 GB (for Windows 10) is reserved for system recovery software.	
2 TB PCIe® Gen3 x4 NVMe™ M.2 2280 TLC Solid State Drive (SSD)	**Form Factor**	M.2 2280	
	Drive Weight	0.02 lb (10 g)	
	Capacity	2 TB	
	NAND Type	TLC	
	Height	0.09 in (2.3 mm)	
	Width	0.87 in (22 mm)	
	Interface	PCIe® Gen3 x4 NVMe™	
	Performance	**Maximum Sequential Read**	**Maximum Sequential Write**
		Up to 3100 ~ 3500 MB/s	Up to 2800 ~ 3000 MB/s
	Logical Blocks	3,907,029,168	
	Operating Temperature	32° to 158°F (0° to 70°C) [ambient temp]	

	Features	ATA Security; TRIM; L1.2	
		Note: For storage drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 35 GB (for Windows 10) is reserved for system recovery software.	
512 GB PCIe® Gen3 x4 NVMe™ M.2 2280 TLC Self Encrypting (SED) Solid State Drive (SSD)	**Form Factor**	M.2 2280	
	Drive Weight	0.02 lb (10 g)	
	Capacity	512 GB	
	NAND Type	TLC	
	Height	0.09 in (2.3 mm)	
	Width	0.87 in (22 mm)	
	Interface	PCIe® Gen3 x4 NVMe™	
	Performance	**Maximum Sequential Read**	**Maximum Sequential Write**
		Up to 3100 ~ 3500 MB/s	Up to 2400 ~ 2956 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	
		Note: For storage drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 35 GB (for Windows 10) is reserved for system recovery software.	
512 GB PCIe® Gen3 x2 NVMe™ M.2 2280 TLC Value Solid State Drive (SSD)	**Form Factor**	M.2 2280	
	Drive Weight	0.02 lb (10 g)	
	Capacity	512 GB	
	NAND Type	Value TLC	
	Height	0.09 in (2.3 mm)	
	Width	0.87 in (22 mm)	
	Interface	PCIe® Gen3 x2 NVMe™	
	Performance	**Maximum Sequential Read**	**Maximum Sequential Write**
		Up to 1500 ~ 2400 MB/s	Up to 1000 ~ 1750 MB/s
	Logical Blocks	1,000,215,215	
	Operating Temperature	32° to 158°F (0° to 70°C) [ambient temp]	
	Features	ATA Security (Option); TRIM; L1.2	
		Note: For storage drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 35 GB (for Windows 10) is reserved for system recovery software.	
512 GB PCIe® Gen3 x4 NVMe™ M.2 2280 QLC Solid State Drive (SSD) + 32 GB Intel® Optane™ Memory	**Form Factor**	M.2 2280	
	Drive Weight	0.02 lb (10 g)	
	Capacity	512 GB	
	NAND Type	QLC+3D XPoint	
	Height	0.09 in (2.3 mm)	
	Width	0.87 in (22 mm)	
	Interface	PCIe® Gen3 x4 NVMe™	
	Performance	**Maximum Sequential Read**	**Maximum Sequential Write**
		Up to 2400 MB/s	Up to 1300 MB/s
	Logical Blocks	1,000,215,215	
	Operating Temperature	32° to 158°F (0° to 70°C) [ambient temp]	

Technical Specifications – Storage

	Features	ATA Security; TRIM; L1.2 **Note:** For storage drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 35 GB (for Windows 10) is reserved for system recovery software.	
512 GB PCIe® Gen3 x4 NVMe™ M.2 2280 TLC Self Encrypting (SED) Solid State Drive (SSD)	**Form Factor**	M.2 2280	
	Drive Weight	0.02 lb (10 g)	
	Capacity	512 GB	
	NAND Type	TLC	
	Height	0.09 in (2.3 mm)	
	Width	0.87 in (22 mm)	
	Interface	PCIe® Gen3 x4 NVMe™	
	Performance	**Maximum Sequential Read**	**Maximum Sequential Write**
		Up to 3100 ~ 3500 MB/s	Up to 2400 ~ 2956 MB/s
	Logical Blocks	1,000,215,215	
	Operating Temperature	32° to 158°F (0° to 70°C) [ambient temp]	
	Features	ATA Security (Option); TCG Opal 2.0; TRIM; L1.2 **Note:** For storage drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 35 GB (for Windows 10) is reserved for system recovery software.	

NETWORKING/COMMUNICATION

Intel® Wi-Fi 6 AX201 (2x2) and Bluetooth® 5 combo*	**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	Wi-Fi certified
	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[1]	• IEEE and WiFi compliant 64 / 128 bit WEP encryption for a/b/g mode only • AES-CCMP: 128 bit in hardware • 802.1x authentication • WPA, WPA2: 802.1x. WPA-PSK, WPA2-PSK, TKIP, and AES. • WPA2 certification • WPA3 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	
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 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 : 2.8g 2. Type 126: 1.3g	
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 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

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 + 9.5 dBm for BR and EDR.
Power Consumption	Peak (Tx): 330 mW Peak (Rx): 230 mW Selective Suspend: 17 mW
Bluetooth Software Supported	Microsoft Windows Bluetooth Software
Link Topology	
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)

* Wireless access point and Internet service required and sold separately. Availability of public wireless access points limited. Wi-Fi 6 (802.11ax) is backwards compatible with prior 802.11 specs. The specifications for Wi-Fi 6 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.

Intel® Wi-Fi 6 AX201 (2x2) and Bluetooth® 5 combo*	**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

Technical Specifications – Networking

Interoperability	Wi-Fi certified
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[1]	• IEEE and WiFi compliant 64 / 128 bit WEP encryption for a/b/g mode only • AES-CCMP: 128 bit in hardware • 802.1x authentication • WPA, WPA2: 802.1x. WPA-PSK, WPA2-PSK, TKIP, and AES. • WPA2 certification • WPA3 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
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 : 2.8g 2. Type 126: 1.3g	
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	

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

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 + 9.5 dBm for BR and EDR.
Power Consumption	Peak (Tx): 330 mW Peak (Rx): 230 mW Selective Suspend: 17 mW
Bluetooth Software Supported	Microsoft Windows Bluetooth Software
Link Topology	
Power Management	Microsoft Windows ACPI, and USB Bus Support
Certifications	FCC (47 CFR) Part 15C, Section 15.247 & 15.249

Technical Specifications – Networking

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)
Security & Manageability	Intel® vPro™ support with appropriate Intel® chipset components

* Wireless access point and Internet service required and sold separately. Availability of public wireless access points limited. Wi-Fi 6 (802.11ax) is backwards compatible with prior 802.11 specs. The specifications for Wi-Fi 6 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.

Intel® XMM™ 7360 LTE-Advanced CAT9 *

Technology/Operating bands	FDD LTE: 2100 (Band 1), 1900 (Band 2), 1800 (Band 3), 1700/2100 (Band 4), 850 (Band 5), 2600 (Band 7), 900 (Band 8), 1400 (Band 11), 700 (Band 12 lower), 700 (Band 13 upper), 700 (Band 17 lower), 850 (Band 18 lower), 850 (Band 19 upper), 800 (Band 20), 1400 (Band 21), 850 (Band 26), 700 (Band 28), 700 (Band 29 RX only), 2300 (Band 30), 1700/2100 (Band 66). TDD LTE: 2600 (Band 38), 1900 (Band 39), 2400 (Band 40), 2500 (Band 41). HSPA+: 2100 (Band 1), 1900 (Band 2), 1700/2100 (Band 4), 850 (Band 5), 900 (Band 8) MHz
Wireless protocol standards	3GPP Release 11 LTE Specification CAT.9, DL 60MHz BW throughput up to 450Mbps; UL 20MHz throughput up to 50Mbps WCDMA R99, 3GPP Release 5, 6, 7 and 8 UMTS Specification
GPS	Standalone, A-GPS (MS-A, MS-B)
GPS bands	1575.42 MHz ± 1.023 MHz, GLONASS 1596-1607MHz, Beidou 1561.098 MHz
Maximum data rates	LTE: 450 Mbps (Download), 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

Technical Specifications – Networking

Weight	5.8 g
Dimensions (Length x Width x Thickness)	42 x 30 x 2.3 mm

* 4G LTE requires separately purchased service contract, and configuration at purchase. 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.

Qualcomm® Snapdragon™ X55 5G Modem*

Technology/Operating bands	**WCDMA/HSDPA/HSUPA/HSPA+ operating bands:** Band 1: 1920 to 1980 MHz (UL), 2110 to 2170 MHz (DL) Band 2: 1850 to 1910 MHz (UL), 1930 to 1990 MHz (DL) Band 4: 1710 to 1755 MHz (UL), 2110 to 2155 MHz (DL) Band 5: 824 to 849 MHz (UL), 869 to 894 MHz (DL) Band 6: 830 to 840 MHz (UL), 875 to 885 MHz (DL) Band 8: 880 to 915 MHz (UL), 925 to 960 MHz (DL) Band 9: 1750 to 1785 MHz(UL), 1845to 1880 MHz (DL) Band 19: 830 to 845 MHz (UL), 875 to 890 MHz (DL) **LTE FDD/TDD operating bands:** Band 1: 1920 to 1980 MHz (UL), 2110 to 2170 MHz (DL) Band 2: 1850 to 1910 MHz (UL), 1930 to 1990 MHz (DL) Band 3: 1710 to 1785 MHz (UL), 1805 to 1880 MHz (DL) Band 4: 1710 to 1755 MHz (UL), 2110 to 2155 MHz (DL) Band 5: 824 to 849 MHz (UL), 869 to 894 MHz (DL) Band 7: 2500 to 2570 MHz (UL), 2620 to 2690 MHz (DL) Band 8: 880 to 915 MHz (UL), 925 to 960 MHz (DL) Band 12: 699 to 716 MHz (UL), 729 to 746 MHz (DL) Band 13: 777 to 787 MHz (UL), 746 to 756 MHz (DL) Band 14: 788 to 798 MHz (UL), 758 to 768 MHz (DL) Band 17: 704 to 716 MHz (UL), 734 to 746 MHz (DL) Band 18: 815 to 830 MHz (UL), 860 to 875 MHz (DL) Band 19: 830 to 845 MHz (UL), 875 to 890 MHz (DL) Band 20: 832 to 862 MHz (UL), 791 to 821 MHz (DL) Band 25: 1850 to 1915 MHz (UL), 1930 to 1995 MHz (DL) Band 26: 814 to 849 MHz (UL), 859 to 894 MHz (DL) Band 28: 703 to 748 MHz (UL), 758 to 803 MHz (DL) Band 29: 717 to 728 MHz (DL) Band 30: 2305 to 2315 MHz (UL) 2350 to 2360 MHz (DL) Band 32: 1452 to 1496 MHz (DL) Band 34: 2010 to 2025 MHz (UL/DL) Band 38: 2570 to 2620 MHz (UL/DL) Band 39: 1880 to 1920 MHz (UL/DL) Band 40: 2300 to 2400 MHz (UL/DL) Band 41: 2496 to 2690 MHz (UL/DL) Band 42: 3400 to 3600 MHZ (UL/DL) Band 46: 5150 to 5925 MHZ (DL) Band 48: 3550 to 3700 MHZ (UL/DL) Band 66: 1710 to 1800 MHz (UL), 2110 to 2200 MHz (DL) Band 71: 663 to 698 MHz (UL), 617 to 652 MHz (DL) **5GNR Sub 6GHZ** n1: 1920 to 1980 MHz (UL), 2110 to 2170 MHz (DL) n2: 1850 to 1910 MHz (UL), 1930 to 1990 MHz (DL) n3: 1710 to 1785 MHz (UL), 1805 to 1880 MHz (DL)

Technical Specifications – Networking

	n5: 824 to 849 MHz (UL), 869 to 894 MHz (DL) n7: 2500 to 2570 MHz (UL), 2620 to 2690 MHz (DL) n8: 880 to 915 MHz (UL), 925 to 960 MHz (DL) n12: 699 to 716 MHz (UL), 729 to 746 MHz (DL) n20: 832 to 862 MHz (UL), 791 to 821 MHz (DL) n28: 703 to 748 MHz (UL), 758 to 803 MHz (DL) n41: 2496 to 2690 MHz (UL/DL) n66: 1710 to 1800 MHz (UL), 2110 to 2200 MHz (DL) n71: 663 to 698 MHz (UL), 617 to 652 MHz (DL) n77: 3300 to 4200 MHz (UL/DL) n78: 3300 to 3800 MHz (UL/DL) n79: 4400 to 5000 MHz (UL/DL)
Wireless protocol standards	**5GNR Air Interface** l 3GPP Rel15 5G NR sub-6 **LTE Rel14** 20 layers and 2 Gbps downlink (DL) throughput – 4 × 4 MIMO across 5x CA 200 Mbps uplink (UL) throughput – 40 MHz ULCA and 256 QAM **WCDMA** R99, 3GPP Release 5, 6, 7 and 8 UMTS Specification
GPS	Standalone, A-GPS (MS-A, MS-B)
GPS Bands	GPS: L1 (1575.42MHz); L5 (1176MHz) GLONASS: L1 (1602MHz) BeidouB1(1561.098MHz) Galileo E1 (1575.42); E5a (1176MHz)
Maximum Data Rates	5G sub 6G : 3.8 Gbps LTE: ue-CategoryDL 20, (DL : 2 Gbps) ue-CategoryUL 13 , (UL: 150Mbps) DC-HSPA+: 42 Mbps (Download), 5.76 Mbps (Upload) HSPA+: 21Mbps (Download), 5.76 Mbps (Upload)
Maximum Output Power	LTE: 23 dBm in all band except B41 LTE B41 HPUE = 26dBm HSPA+: 23.5 dBm
Maximum Power Consumption	5G Sub 6 : 2500 mA LTE: 1,300 mA (peak); 1100 mA (average) HSPA+: 1,100 mA (peak); 800 mA (average)
Form Factor	M.2, 3042-S3 Key B
Weight	8 g
Dimensions (Length x Width x Thickness)	42 mm × 30 mm × 2.6 mm

* WWAN modules for 5G ready platforms are optional features that can be configured at purchase or added later by the customer. 5G module supports AT&T and T-Mobile networks in the U.S. Module designed for 5G networks as carriers deploy Evolved-Universal Terrestrial Radio Access New Radio Dual Connectivity (ENDC) with both 100Mhz of 5G NR and LTE channel bandwidth, using 256QAM 4x4 as defined by 3GPP, requires activation and separately purchased service contract. Check with service provider for coverage and availability in your area. Connection, upload and download speeds will vary due to network, location, environment, network conditions, and other factors. 5G not available on all products, in all regions. Backwards compatible to 4G LTE and 3G HSPA technologies. 5G module planned to be available in select countries, where carrier supported.

Near Field Communications Controller (optional)

Dimensions (L x W x H)	Module 25 mm by 10 mm by 2.0 mm
Chipset	NPC300

Technical Specifications – Networking

System interface	I2C		
NFC RF standards	ISO/IEC 14443 A ISO/IEC 14443 B ISO/IEC 15693 ISO/IEC 18092 ECMA-340 NFCIP-1 Target and Initiator ECMA-320 NFCIP-2		
NFC Forum Support	Tag Type 1, Type 2, Type3 and Type 4, NFCIP-1 and NFCIP-2		
Reader (PCD-VCD) Mode(1)	ISO/IEC 14443 A ISO/IEC 14443 B ISO/IEC 15693 MIFARE 1K MIFARE 4K MIFARE DESFire FeliCa Jewel and Topaz cards		
Card Emulation (PICC-VICC) Mode(1)	ISO/IEC 14443 A ISO/IEC 14443 B and B' MIFARE FeliCa		
Frequency	13.56 MHz		
NFC Modes Supported	Reader/Writer, Peer-to-Peer		
Raw RF Data Rates	106, 212, 424, 848 kbps		
Operating temperature	0°C to 70°C		
Storage temperature	-20°C to 125°C		
Humidity	10-90% operating 5-95% non-operating		
Supply Operating voltage	4.35 to 5.25 Volts		
I/O Voltage	1.8V or 3.3V		
Power Consumption	**Booster enable,**	VBAT= 3.3V,	
	VCC_BOOST = 5V) Mode Power Consumption, Typical	**Polling**	7.3 mA
		Detected Test Tag Type 1	Total 283.8 mA Net Module 236.8 mA
		Detected Test Tag Type 2	Total 288.8 mA Net Module 241.8 mA
		Detected Test Tag Type 3	Total 287.7 mA Net Module 240.7 mA
		Detected Test Tag Type 4	Total 282.3 mA Net Module 235.3 mA
Antenna	Antenna connector, 0.5mm pitch, 7 connector FPC. Antenna matching is external to module.		

POWER

AC Adapter 45 Watt Smart nPFC Standard Barrel 4.5mm Right Angle 1.8m	**Dimensions**	95x45x26.8mm	
	Weight	unit: 200g +/- 10g	
	Input	**Input Efficiency**	87.74 % at 115 Vac and 88.4 % at 230Vac
		Input frequency range	47 ~ 63 Hz
		Input AC current	Max. 1.4 A at 90 Vac
	Output	**Output power**	45W
		DC output	19.5V
		Hold-up time	5ms at 115 Vac input
		Output current limit	<8.0A
	Connector	4.5mm Barrel Type	
	Environmental Design	**Operating temperature**	32° to 95° F (0° to 35° C)
		Non-operating (storage) temperature	-4° 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	Eg: *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**	95x45x26.8mm	
	Weight	unit: 200g +/- 10g	
	Input	**Input Efficiency**	87.74 % at 115 Vac and 88.4 % at 230Vac
		Input frequency range	47 to 63 Hz
		Input AC current	Max. 1.4 A at 90 Vac
	Output	**Output power**	45W
		DC output	19.5V
		Hold-up time	5ms at 115 Vac input
		Output current limit	<8.0A
	Connector	4.5mm Barrel Type	
	Environmental Design	**Operating temperature**	32° to 95° F (0° to 35° C)

		Non-operating (storage) temperature	-4° 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	Eg: *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 Slim USB Type-C® Straight 1.8m	**Dimensions**	88x53.5x21mm	
	Weight	unit: 220g +/- 10g	
	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**	65W
		DC output	5V/9V/12V/15V/20V
		Hold-up time	5ms at 115 Vac input
		Output current limit	<8.0A
	Connector	USB Type C®	
	Environmental Design	**Operating temperature**	32° to 95° F (0° to 35° C)
		Non-operating (storage) temperature	-4° to 185° F (-20° to 85° C)
		Altitude	0 to 16,400 ft (0 to 5000m)
		Humidity	5% to 95%
		Storage Humidity	5% to 95%
	EMI and Safety Certifications	Eg: *CE Mark - full compliance with LVD and EMC directives * Worldwide safety standards - IEC60950, EN60950, UL60950, Class1, SELV; Agency approvals - C-UL-US, NORDICS, DENAN, EN55022 Class B, FCC Class B, CISPR22 Class B, CCC, NOM-1 NYCE. * MTBF - over 100,000 hours at 25°C ambient condition.	

Technical Specifications – Power

AC Adapter 65 Watt nPFC Standard USB Type-C® Straight 1.8m	**Dimensions**	90.0x51x28.5mm	
	Weight	unit: 250g +/- 10g	
	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**	65W
		DC output	5V/9V/12V/15V/20V
		Hold-up time	5ms at 115 Vac input
		Output current limit	8.0A Max.
	Connector	USB TYPE C®	
	Environmental Design	**Operating temperature**	32° to 95° F (0° to 35° C)
		Non-operating (storage) temperature	-4° 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	Eg: "CE Mark - full compliance with LVD and EMC directives *Worldwide safety standards -IEC60950, EN60950, UL60950, UL62368, 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 Emerging Market	**Dimensions**	102x55x30mm	
	Weight	unit: 250g +/- 10g	
	Input	**Input Efficiency**	88.0 % at 115 Vac and 89.0 % at 230Vac
		Input frequency range	47 ~ 63 Hz
		Input AC current	Max. 1.7 A at 90 Vac
	Output	**Output power**	65W
		DC output	19.5V
		Hold-up time	5ms at 115 Vac input
		Output 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	Eg: *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**	90x51x28.5mm	
	Weight	unit: 230g +/- 10g	
	Input	**Input Efficiency**	88.0 % at 115 Vac and 89.0 % at 230Vac
		Input frequency range	47 ~ 63 Hz
		Input AC current	Max. 1.7 A at 90 Vac
	Output	**Output power**	65W
		DC output	19.5V
		Hold-up time	5ms at 115 Vac input
		Output current limit	<11.0A
	Connector	4.5mm Barrel Type	
	Environmental Design	**Operating temperature**	32° to 95° F (0° to 35° C)
		Non-operating (storage) temperature	-4° 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	Eg: *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.	
3 Cell 53 Wh HP Long Life Battery*; supporting HP Fast Charge	**Dimensions (H x W x L)**	7.3 x 52.9 x 267.11mm (0.287 x 2.082 x 10.516 inch)	
	Weight	0.205kg (0.45 lb)	
	Cells/Type	3cell Lithium-Ion Polymer cell / 645180	
	Energy	Voltage	11.55V
		Amp-hour capacity	4.59Ah
		Watt-hour capacity	53Wh
	Temperature	Operating (Charging)	32° to 122° F (0° to 50° C)
		Operating (Discharging)	14° to 140° F (-10° to 60° C)
	Fuel Gauge LED	NA	
	Warranty	Depends on system offering	

Technical Specifications – Power

Optional Travel Battery Available	No

*Actual battery Watt-hours (Wh) will vary from design capacity. Battery capacity will naturally decrease with shelf life, time, usage, environment, temperature, system configuration, loaded apps, features, power management settings and other factors.

ENVIRONMENTAL DATA

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.

Sustainable Impact Specifications

- 40% post-consumer recycled plastic[4]
- Low halogen[1]
- Outside Box and corrugated cushions are 100% sustainably sourced and recyclable[3]
- Molded Paper Pulp Cushion inside box is 100% sustainably sourced and recyclable[5]
- Bulk packaging available
- Ocean-Bound Plastic in speaker enclosure[2]

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 ENERGY STAR® test method)	**115VAC, 60Hz**	**230VAC, 50Hz**	**100VAC, 60Hz**
Normal Operation (Short idle)	TBD	TBD	TBD
Normal Operation (Long idle)	TBD	TBD	TBD
Sleep	TBD	TBD	TBD
Off	TBD	TBD	TBD

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)	TBD	TBD	TBD
Normal Operation (Long idle)	TBD	TBD	TBD
Sleep	TBD	TBD	TBD
Off	TBD	TBD	TBD

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

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

Longevity and Upgrading

"This product can be upgraded, possibly extending its useful life by several years.

Technical Specifications – Environmental

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

Batteries

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

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

Battery description: 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 7.8% post-consumer recycled plastic (by wt.)
- This product is 96.1% recycle-able when properly disposed of at end of life.

Packaging Materials

External:	PAPER/Cardboard & misc	TBD
Internal:	PLASTIC/EPE (Expanded Polyethylene)	TBD
	PLASTIC/Polyethylene low density	TBD
	PLASTIC/Polypropylene	TBD

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

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

Material Usage

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

- Asbestos
- Certain Azo Colorants
- Certain Brominated Flame Retardants – may not be used as flame retardants in plastics
- Cadmium
- Chlorinated Hydrocarbons
- Chlorinated Paraffins
- Formaldehyde
- Halogenated Diphenyl Methanes
- Lead carbonates and sulfates
- Lead and Lead compounds
- Mercuric Oxide Batteries
- Nickel – finishes must not be used on the external surface designed to be frequently handled or carried by the user.
- Ozone Depleting Substances
- Polybrominated Biphenyls (PBBs)
- Polybrominated Biphenyl Ethers (PBBEs)

- Polybrominated Biphenyl Oxides (PBBOs)
- Polychlorinated Biphenyl (PCB)
- Polychlorinated Terphenyls (PCT)
- Polyvinyl Chloride (PVC) – except for wires and cables, has been voluntarily removed from most applications.
- Radioactive Substances
- Tributyl Tin (TBT), Triphenyl Tin (TPT), Tributyl Tin Oxide (TBTO)

Packaging Usage

HP follows these guidelines to decrease the environmental impact of product packaging:

- Eliminate the use of heavy metals such as lead, chromium, mercury and cadmium in packaging materials.
- Eliminate the use of ozone-depleting substances (ODS) in packaging materials.
- Design packaging materials for ease of disassembly.
- Maximize the use of post-consumer recycled content materials in packaging materials.
- Use readily recyclable packaging materials such as paper and corrugated materials.
- Reduce size and weight of packages to improve transportation fuel efficiency.
- Plastic packaging materials are marked according to ISO 11469 and DIN 6120 standards.

End-of-life Management and Recycling

HP 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 HP web site at: http://www.hp.com/go/recyclers. These instructions may be used by recyclers and other WEEE treatment facilities as well as HP OEM customers who integrate and re-sell HP equipment.

HP Inc. Corporate Environmental Information

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

Global Citizenship Report
http://www.hp.com/hpinfo/globalcitizenship/gcreport/index.html
Eco-label certifications
http://www8.hp.com/us/en/hp-information/environment/ecolabels.html
ISO 14001 certificates:
http://h20195.www2.hp.com/V2/GetDocument.aspx?docname=c04755842
and
http://www.hp.com/hpinfo/globalcitizenship/environment/pdf/cert.pdf

Footnotes

[1] External power supplies, WWAN modules, power cords, cables and peripherals excluded. Service parts obtained after purchase may not be Low Halogen.
[2] Percentage of ocean-bound plastic contained in each component varies by product
[3] 100% outer box packaging and corrugated cushions made from sustainably sourced certified and recycled fibers.
[4] Recycled plastic content percentage is based on the definition set in the IEEE 1680.1-2018 standard.
[5] Molded pulp cushions are made from 100% recycled wood fiber and organic materials.

Date of change:	**Version History:**		**Description of change:**
December 11, 2020	From v1 to v2	Changed	Format
March 2, 2021	From v2 to v3	Changed	ENVIRONMENTAL DATA section
April 21, 2021	From v3 to v4	Changed	GRAPHICS section
May 3, 2021	From v4 to v5	Changed	POWER section
		Removed	Adobe from ISV certified
May 11, 2021	From v5 to v6	Changed	PROCESSOR section