

### Overview

#### HP EliteBook 650 15.6 inch G9 Notebook PC



#### Left

- |                                                |                                                                    |
|------------------------------------------------|--------------------------------------------------------------------|
| 1. Internal Microphones (2)                    | 6. Clickpad                                                        |
| 2. Webcam LED (Optional)                       | 7. Smartcard Reader (Optional)                                     |
| 3. Camera Shutter (Only available with webcam) | 8. SuperSpeed USB Type-A 5Gbps signaling rate port (USB 3.2 Gen 1) |
| 4. HD TNR and IR Camera (Optional)             | 9. Ethernet Port (RJ-45) <sup>1</sup>                              |
| 5. IR Camera LED (Optional)                    | 10. Nano Security Lock Slot (Lock sold separately)                 |
| 1. RJ-45 port icon may vary.                   |                                                                    |

### Overview



#### Right

- |                                                                                                   |                                             |
|---------------------------------------------------------------------------------------------------|---------------------------------------------|
| 1. Power Button Key                                                                               | 6. HDMI 2.0b Port (Cable not included)      |
| 2. Power Connector                                                                                | 7. Audio Combo Jack                         |
| 3. Thunderbolt™ 4 with USB4 Type-C® 40Gbps signaling rate (USB Power Delivery, DisplayPort™ 1.4)¹ | 8. External SIM Card Slot (Optional)        |
| 4. SuperSpeed USB Type-A 5Gbps signaling rate port (Powered port) (USB 3.2 Gen 1)                 | 9. Touch Fingerprint Sensor (Select Models) |
| 5. SuperSpeed USB Type-A 5Gbps signaling rate port (USB 3.2 Gen 1)                                |                                             |

1. SuperSpeed USB 20Gbps is not available with Thunderbolt™ 4

## Overview

### AT A GLANCE

- Preinstalled with Windows 11 versions or FreeDOS
- Choice of 12th generation Intel® Core™ i7, i5 and i3 processors
- NVIDIA® GeForce® MX570 discrete graphics with 2 GB GDDR6 video memory
- NVIDIA® GeForce® MX570A discrete graphics with 2 GB GDDR6 video memory
- Fast and upgradeable dual channel DDR4 SODIMM memory up to 64 GB
- Choice of 39.6 cm (15.6") diagonal HD, Ultra Wide Viewing Angle FHD, Touch or Non-Touch screen option
- Features redesigned quiet and responsive HP Keyboard with the HP Programmable key and backlit options
- Choice of solid state drives up to 1 TB
- Multi-layered security with HP SureStart Gen7<sup>1</sup>, HP Privacy Camera, HP Sure View Gen4<sup>2</sup>, HP Wolf Security (Includes HP Sure Sense<sup>3</sup> and HP Sure Click<sup>4</sup>), HP Secure Erase<sup>5</sup>, HP Client Security Manager Gen7 (Includes Sure Run Gen5<sup>6</sup>, Sure Recover Gen5<sup>7</sup>), Touch Fingerprint reader<sup>8</sup>, and Tamper Lock<sup>9</sup>
- Supports wireless options for connectivity on the go including gigabit-speed Wi-Fi® 6e and CAT9 4G/LTE WWAN
- Supports fast charging (50% in 30 minutes) with no impact on battery recharge cycles<sup>10</sup>
- Designed to support HP docking options
- Passed MIL-STD 810H tests<sup>11</sup>
- Battery Life up to 13 hours with the optional 51.3Whr battery
- Optimize your video calls with an HD camera and Temporal Noise Reduction that adjusts to the lighting in your environment.
- Audio G2G

1. HP Sure Start Gen7 is available on select HP PCs.

2. HP Sure View integrated privacy screen is an optional feature that must be configured at purchase and is designed to function in landscape orientation.

3. HP Sure Sense is available on select HP PCs and is not available with Windows 11 Home.

4. HP Sure Click requires Windows 11. See [https://bit.ly/2PrLT6A\\_SureClick](https://bit.ly/2PrLT6A_SureClick) for complete details.

5. 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™.

6. HP Sure Run Gen4 is available on select Windows based HP Pro, Elite and Workstation PCs with select Intel® or AMD processors.

7. HP Sure Recover Gen5 is available on select HP PCs and requires Windows 10 and higher and an open network connection. You must back up important files, data, photos, videos, etc. before using HP Sure Recover to avoid loss of data. Network based recovery using Wi-Fi is only available on PCs with Intel Wi-Fi Module.

8. Sold separately or as an optional feature

9. HP Tamper Lock must be enabled by the customer or your administrator.

10. 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.

11. 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.**

## Technical Specifications

## PRODUCT NAME

HP EliteBook 650 15.6" G9 Notebook PC

## OPERATING SYSTEM

**Preinstalled** Windows 11 Pro <sup>1</sup>  
 Windows 11 Pro Education <sup>1</sup>  
 Windows 11 Home – HP recommends Windows 11 Pro for Business <sup>1</sup>  
 Windows 11 Home Single Language – HP recommends Windows 11 Pro for Business <sup>1</sup>  
 Windows 11 Pro (Windows 11 Enterprise available with a Volume Licensing Agreement) <sup>1</sup>  
 Windows 10 Pro (available through downgrade rights from Windows 11 Pro) <sup>1,2</sup>  
 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 and enabled. High speed internet and Microsoft account required. ISP fees may apply and additional requirements may apply over time for updates. See <http://www.windows.com>.

2. This system is preinstalled with Windows 10 Pro software and also comes with a license for Windows 11 Pro software and provision for recovery software. You may only use one version of the Windows software at a time. Switching between versions will require you to uninstall one version and install the other version. You must back up all data (files, photos, etc.) before uninstalling and installing operating systems to avoid loss of your data.

## PROCESSORS

Processor 3,4,5,6,7	Cores	Number of P-cores	Number of E-cores	Threads	L3 Cache	Max Turbo Frequency		Base Frequency		Intel SIPP/ vPro® Enterprise	Intel vPro® Essentials
						P- cores	E- cores	P- cores	E- cores		
Intel® Core™ i7- 1270P	12	4	8	16	18MB	4.8 GHz	3.5 GHz	2.2 GHz	1.6 GHz	X	
Intel® Core™ i5- 1250P	12	4	8	16	12MB	4.4 GHz	3.3 GHz	1.7 GHz	1.2 GHz	X	
Intel® Core™ i7- 1265U	10	2	8	12	12MB	4.8 GHz	3.6 GHz	1.8 GHz	1.3 GHz	X	
Intel® Core™ i7- 1255U	10	2	8	12	12MB	4.7 GHz	3.5 GHz	1.7 GHz	1.2 GHz		X
Intel® Core™ i5- 1245U	10	2	8	12	12MB	4.4 GHz	3.3 GHz	1.2 GHz	1.2 GHz	X	
Intel® Core™ i5- 1235U	10	2	8	12	12MB	4.4 GHz	3.3 GHz	1.3 GHz	0.9 GHz		X



## Technical Specifications

Intel® Core™ i3- 1215U	6	2	4	8	10MB	4.4 GHz	3.3 GHz	1.2 GHz	0.9 GHz		
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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.

6. 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>.

7. Intel vPro® requires Windows 10 Pro 64 bit or higher, a vPro supported processor, vPro enabled chipset, vPro enabled wired LAN and/or Wi-Fi 6E WLAN and TPM 2.0. Some functionality requires additional 3rd party software in order to run. Features of vPro® Essentials and Enterprise vary. See <http://intel.com/vpro>

## CHIPSET

Chipset is integrated with processor

## GRAPHICS

**Integrated**

Intel® Iris® Xe Graphics (Core i5 and Core i7) <sup>8</sup>

Intel® UHD Graphics (Core i3)

**Discrete**

NVIDIA GeForce® MX570 Controller

NVIDIA GeForce® MX570A Controller

**Supports**

Support HD decode, DX12, HDMI 2.1b <sup>9</sup>

8. 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 i7 processors and single channel memory will only function as UHD graphics.

9. HD content required to view HD images.

### Technical Specifications

#### DISPLAY

##### Non-Touch

39.6 cm (15.6") diagonal FHD (1920x1080) UWVA eDP, anti-glare, LED, low power, narrow bezel bent, 400 nits, 100% for HD + IR camera for WWAN <sup>9,11</sup>

39.6 cm (15.6") diagonal FHD (1920x1080) UWVA eDP, anti-glare, WLED, low power, narrow bezel bent, 400 nits, 100% for HD camera <sup>9,11</sup>

39.6 cm (15.6") diagonal FHD (1920x1080) UWVA eDP, anti-glare, LED, narrow bezel bent, 250 nits, 45% for HD + IR camera for WWAN <sup>9,11</sup>

39.6 cm (15.6") diagonal FHD (1920x1080) UWVA eDP, anti-glare, LED, narrow bezel bent, 250 nits, 45% for HD + IR camera <sup>9,11</sup>

39.6 cm (15.6") diagonal FHD (1920x1080) UWVA eDP, anti-glare, WLED, narrow bezel bent, 250 nits, 45% for HD camera for WWAN <sup>9,11</sup>

39.6 cm (15.6") diagonal FHD (1920x1080) UWVA eDP, anti-glare, WLED, narrow bezel bent, 250 nits, 45% for HD camera <sup>9,11</sup>

39.6 cm (15.6") diagonal FHD (1920x1080) UWVA eDP 1.2 w/o PSR, anti-glare, WLED, narrow bezel bent, 250 nits, 45% <sup>9,11</sup>

39.6 cm (15.6") diagonal HD (1920x1080) SVA, eDP 1.2 w/o PSR, anti-glare, WLED, narrow bezel bent, 250 nits, 45% <sup>9,11</sup>

39.6 cm (15.6") diagonal HD (1920x1080) SVA, eDP, anti-glare, WLED, narrow bezel bent, 250 nits, 45% for HD camera <sup>9,11</sup>

##### 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 + IR camera and WWAN (1920 x 1080) <sup>9,10,11,12</sup>

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) <sup>9,10,11,12</sup>

##### Display Size

15.6" diagonal

39.6 cm (15.6") diagonal

9. 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. Actual brightness will be lower with touchscreen.

#### DOCKING (Sold Separately)

**Docking station model #1**

HP USB-C Dock G5

**Docking station model #2**

HP USB-C/A Universal Dock G2

**Docking station model #3**

HP Thunderbolt Dock G2

For additional aftermarket options and docking specs please see page 41.

### Technical Specifications

#### STORAGE AND DRIVES

##### Primary M.2 Storage

1 TB PCIe® Gen4x4 NVMe™ M.2 TLC Solid State Drive <sup>13</sup>  
512 GB PCIe® Gen4x4 NVMe™ M.2 TLC Self Encrypted OPAL2 Solid State Drive <sup>13</sup>  
512 GB PCIe® Gen4x4 NVMe™ M.2 TLC Solid State Drive <sup>13</sup>  
512 GB PCIe® NVMe™ M.2 SSD <sup>13</sup>  
256 GB PCIe® Gen4x4 NVMe™ M.2 TLC Self Encrypted OPAL2 Solid State Drive <sup>13</sup>  
256 GB PCIe® Gen4x4 NVMe™ M.2 TLC single-sided Solid State Drive <sup>13</sup>  
256 GB PCIe® NVMe™ M.2 SSD <sup>13</sup>

##### Secondary M.2 Storage (Optional)

128 GB PCIe® NVMe™ M.2 Value Solid State Drive <sup>13,14</sup>  
256 GB PCIe® NVMe™ M.2 Value Solid State Drive <sup>13,14</sup>

13. For storage drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 30 GB (for Windows 10 and 11) is reserved for system recovery software

14. Second storage is only available with non-WWAN base Unit AND Primary M.2 storage

#### MEMORY

##### Maximum Memory

64 GB DDR4-3200 SDRAM <sup>15</sup>

##### Memory

64 GB DDR4-3200 SDRAM (2x32GB) <sup>15</sup>  
32 GB DDR4-3200 SDRAM (2x16GB) <sup>15</sup>  
32 GB DDR4-3200 SDRAM (1x32GB) <sup>15</sup>  
16 GB DDR4-3200 SDRAM (2x8GB) <sup>15</sup>  
16 GB DDR4-3200 SDRAM (1x16GB) <sup>15</sup>  
8 GB DDR4-3200 SDRAM (1x8GB) <sup>15</sup>

##### Memory Slots

2 SODIMM  
Both slots are customer accessible / upgradeable  
DDR4 PC4 SODIMMS (Alder Lake runs at 3200)  
Supports Dual Channel Memory

15. Due to the non-industry standard nature of some third-party memory modules, we recommend HP branded memory to ensure compatibility. If you mix memory speeds, the system will perform at the lower memory speed.

### Technical Specifications

#### NETWORKING/COMMUNICATIONS

##### WLAN

Intel® AX211 Wi-Fi 6E and Bluetooth® 5.2 M.2 2230 160MHz CNVi World-Wide WLAN <sup>16</sup>

Intel® AX211 Wi-Fi 6E and Bluetooth® 5.2 M.2 2230 vPro 160MHz CNVi World-Wide WLAN <sup>16</sup>

##### WWAN

Intel® XMM™ 7560 R+ LTE-Advanced Pro <sup>17</sup>

##### NFC

NXP NPC300 Near Field Communication Module (NFC Mirage WNC XRAV-1)

##### Miracast

Native Miracast Support

##### Ethernet

Intel® I219-LM 1 Gigabit Network Connection LOM (vPro) <sup>18</sup>

Intel® I219v 1 Gigabit Network Connection LOM (non-vPro) <sup>18</sup>

##### Wake on WLAN

Support on S3 AC mode only

16. Wi-Fi 6E requires a Wi-Fi 6E router, sold separately, to function in the 6GHz band. Availability of public wireless access points limited. Wi-Fi 6E is backwards compatible with prior 802.11 specs. And available in countries where Wi-Fi 6E is supported.

17. WWAN module is an optional feature, requires factory configuration 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.

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

#### AUDIO/MULTIMEDIA

##### Audio

2 Integrated stereo speakers

Integrated microphone (Dual Array)

##### Speaker Power

2W/4ohm Per speaker

##### Camera

720p HD camera with Temporal Noise Reduction <sup>9</sup>

720p HD camera+IR Camera with Temporal Noise Reduction <sup>9,10</sup>

9. HD content required to view HD images.

10. Sold separately or as an optional feature.



### Technical Specifications

#### KEYBOARDS/POINTING DEVICES/BUTTONS & FUNCTION KEYS

**Keyboard**

HP Premium Keyboard, spill resistant with numeric keypad and optional backlit function <sup>19</sup>

**Pointing Device**

Clickpad with multi-touch gesture support

**Function Keys**

F1 - Display Switching

F2 - Blank

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 - Wireless

F12 - Programmable key

**Hidden Function Keys**

Fn+R - Break

Fn+S - Sys Rq

Fn+C - Scroll Lock

[19. Backlit keyboard is an optional feature.](#)

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### Technical Specifications

#### SOFTWARE AND SECURITY

##### Preinstalled Software

HP Quick Touch  
HP Quick Drop <sup>20</sup>  
myHP  
HP Smart Support <sup>21</sup>  
HP Connection Optimizer  
HP Power Manager  
HP Hotkey Support  
HP Support Assistant <sup>22</sup>  
HP Notifications  
HP Privacy Settings  
Buy Microsoft Office (Sold separately)

##### Manageability Features

HP Manageability Integration Kit Gen4 (download) <sup>23</sup>  
HP Driver Packs (download)  
HP Client Catalog (download)  
HP Client Management Script Library (download)  
HP Image Assistant (download)

**NOTE:** To enhance brightness, level go to the Intel® Graphics Command Center app, click on System and turn off the Display Power Savings function.

##### Security Management

##### HP Wolf Security for Business<sup>24</sup> includes:

HP Sure Click <sup>25</sup>  
HP Sure Sense <sup>26</sup>  
HP Sure Run Gen5 <sup>27</sup>  
HP Sure Recover Gen5 <sup>28</sup>  
HP Sure Start Gen7 <sup>29</sup>  
HP Tamper Lock  
HP Sure Admin <sup>30</sup>  
HP Client Security Manager Gen7 <sup>31</sup>  
TPM 2.0 Embedded Security Chip (Common Criteria EAL4+ Certified) (FIPS 140-2 Level 2 Certified)

##### BIOS

HP BIOSphere Gen6 <sup>32</sup>  
HP Secure Erase <sup>33</sup>  
Absolute Persistence Module <sup>34</sup>  
HP DriveLock & Automatic DriveLock  
BIOS Update via Network  
HP Wake on WLAN  
HP Fingerprint Sensor <sup>35</sup>  
Secured-Core PC Enable <sup>36</sup>

## Technical Specifications

### Security

#### TPM

Model: Infineon SLB9672VU2.0

Version: 15.21

Revision: TPM 2.0

FIPS 140-2 Compliant: Yes

### Smartcard Reader

Model number: Alcor AU9560

FIPS 201 Compliant: Yes

### IPv6 Support

Yes

### FirstNet Certified

No

### Is the BIOS on this notebook ISO/IEC 19678:2015 (formerly NIST 800-147) compliant?: Yes

UEFI version: 2.7

Class: 3

20. HP Quick Drop requires Internet access and Windows 10 or higher 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.

21. HP Smart Support automatically collects the telemetry necessary upon initial boot of the product to deliver device-level configuration data and health insights and is available preinstalled on select products, thru HP Factory Configuration Services; or it can be downloaded. For more information about how to enable HP Smart Support or for download, please visit <http://www.hp.com/smart-support>.

22. HP Support Assistant requires Windows and Internet Access.

23. HP Manageability Integration Kit can be downloaded from <http://www.hp.com/go/clientmanagement>.

24. HP Wolf Security for Business requires Windows 10 or higher, includes various HP security features and is available on HP Pro, Elite, RPOS and Workstation products. See product details for included security features and OS requirement.

25. HP Sure Click requires Windows 10 Pro or higher or Enterprise. See [https://bit.ly/2PrLT6A\\_SureClick](https://bit.ly/2PrLT6A_SureClick) for complete details.

26. HP Sure Sense is available on select HP PCs with Windows 10 Pro, Windows 10 Enterprise, Windows 11 Pro, or Windows 11 Enterprise OS

27. HP Sure Run Gen5 is available on select HP PCs and requires Windows 10 and higher.

28. HP Sure Recover Gen5 is available on select HP PCs and requires Windows 10 and higher and an open network connection. You must back up important files, data, photos, videos, etc. before using HP Sure Recover to avoid loss of data. Network based recovery using Wi-Fi is only available on PCs with Intel Wi-Fi Module.

29. HP Sure Start Gen7 is available on select HP PCs and requires Windows 10 and higher.

30. HP Sure Admin requires Windows 10 or higher, 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.

31. HP Client Security Manager Gen7 requires Windows and is available on the select HP Elite and Pro PCs.

32. HP BIOSphere Gen6 features may vary depending on the platform and configuration.

33. 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™.

34. 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

## Technical Specifications

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/>.

35. Fingerprint Reader is an optional feature that must be configured at purchase.

36. Requires an Intel® vPro®, AMD Ryzen™ Pro processor or Qualcomm® processor with SD850 or higher and requires 8 GB or more system memory. Secured-core PC is enabled from the factory.

## POWER

### Power Supply

HP Smart 65 W External AC power adapter <sup>37</sup>

HP Smart 65 W EM External AC power adapter <sup>37</sup>

HP Smart 65 W USB Type-C™ adapter <sup>37</sup>

HP Smart 45 W External AC power adapter <sup>37</sup>

HP Smart 45 W USB Type-C™ adapter <sup>37</sup>

### Battery

HP Long Life 3-cell, 42.75 Wh Polymer <sup>38,39</sup>

HP Long Life 3-cell, 51.3 Wh Polymer <sup>38,39</sup>

Compliant with UL 1642 Standard

### Power Cord

3-wire plug - 1m <sup>37</sup>

2-wire plug - 1m <sup>37</sup>

### Battery life

Up to 13 hours with 51whr battery (HP Long Life 3-Cell, 51 Whr Polymer, UMA graphic, Intel U15, 200 nits display, 2\*4G memory, 256 GB SSD) <sup>40</sup>

Up to 12 hours and 15 minutes with 51whr battery (HP Long Life 3-Cell, 51 Whr Polymer, UMA graphic, Intel P28, 200 nits display, 2\*4G memory, 256 GB SSD) <sup>40</sup>

Up to 11 hours with 42whr battery (HP Long Life 3-Cell, 42 Whr Polymer, UMA graphic, Intel U15, 200 nits display, 2\*4G memory, 256 GB SSD) <sup>40</sup>

### Battery Weight

#### HP Long Life 3-cell - 42.72 Wh Polymer

.40 lb

181.83 g

#### HP Long Life 3-cell - 51.3 Wh Polymer

.45 lb

203.56 g

37. Availability may vary by country.

38. Battery is internal and not replaceable by customer. Serviceable by warranty.

39. 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.

### Technical Specifications

40. Windows 10 MM18 battery life will vary depending on various factors including product model, configuration, loaded applications, features, use, wireless functionality, and power management settings. The maximum capacity of the battery will naturally decrease with time and usage. See <http://www.bapco.com> for additional details.

### WEIGHTS & DIMENSIONS

#### Product Weight

Starting at 3.83 lb <sup>41</sup>

Starting at 1.74 kg <sup>41</sup>

#### Product Dimensions (W x D x H)

14.15 x 9.20 x 0.78 in

35.94 x 23.39 x 1.99 cm

41. Weight will vary by configuration. Does not include power adapter.

### PORTS/SLOTS

1 Thunderbolt™ 4 with USB4™ Type-C® 40 Gbps signaling rate (USB Power Delivery, DisplayPort™ 2.1b)<sup>42</sup>

3 SuperSpeed USB Type-A 5Gbps signaling rate Port includes 1 Powered port (USB 3.2 Gen 1)

1 AC power

1 HDMI 2.0b <sup>43</sup>

1 Headphone/microphone combo jack

1 Nano SIM slot for WWAN (optional)

1 RJ-45 <sup>44</sup>

#### Expansion Slots

Smart Card Reader (optional)

42. SuperSpeed USB 20Gbps is not available with Thunderbolt™ 4

43. HDMI cable sold separately.

44. RJ-45 port icon may vary.

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#### SERVICE AND SUPPORT

HP Services offers 1-year or 3-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>.<sup>45</sup>

45. 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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#### CERTIFICATION AND COMPLIANCE

Energy Efficiency Compliance:	ENERGY STAR® certified
Energy Efficiency Compliance:	EPEAT® registered <sup>46</sup>
Environmental Specifications:	Low halogen <sup>47</sup>
Environmental Specifications:	TCO 9.0 Certification

46. 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.

47. External power supplies, power cords, cables and peripherals are not Low Halogen. Service parts obtained after purchase may not be Low Halogen.

### Technical Specifications

#### SYSTEM UNIT

##### Stand-Alone Power Requirements (AC Power)

Nominal Operating Voltage	19V
Average Operating Power	U15 UMA 3.72W/U15 DSC 4.56W/U28 3.80W
Integrated graphics	Yes
Discrete Graphics	Yes, GN20-S5
Max Operating Power	Discrete < 65W UMA U15 < 45W, UMA U28 < 65W

##### Temperature

Operating	32° to 95° F (0° to 35° C) (No sustained direct exposure to sunlight) (System performance may be reduced above 32°C (89.6°F))
Non-operating	-4° to 140° F (-20° to 60° C)

##### Relative Humidity

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

##### Shock

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

##### Random Vibration

Operating	1.043 grams
Non-operating	3.5 grams

##### Altitude (unpressurized)

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

##### Planned Industry Standard Certifications

Regulatory Model Number	HSN-Q33C-5
UL	Yes
CSA	Yes
FCC Compliance	Yes
ENERGY STAR®	Yes <sup>48</sup>
EPEAT®	EPEAT® Gold in the United States <sup>49</sup>
ICES	Yes
Australia /	Yes
NZ A-Tick Compliance	Yes
CCC	Yes
Japan VCCI Compliance	Yes
KC	Yes
BSMI	Yes
CE Marking Compliance	Yes
BNCI or BELUS	Yes
CIT	Yes
EAC	Yes
Saudi Arabian Compliance (ICCP)	Yes
SABS	Yes
UKRSERTCOMPUTER	Yes

## Technical Specifications

48. Configurations of the HP EliteBook 650 G9 that are ENERGY STAR® qualified are identified as HP EliteBook 650 G9 ENERGY STAR on HP websites and on <http://www.energystar.gov>.

49. 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.

1. Actual brightness will be lower with touchscreen or HP Sure View.

<b>Panel LCD 15.6 inch FHD (1920 x 1080) Anti-Glare WLED UWVA 45percent cg 250nits eDP 1.2 w/o PSR bent Touch on Panel NWBZ</b>	<b>Outline Dimensions (W x H)</b>	350.960 x 205.740 mm (max)
	<b>Active Area</b>	344.160 x 193.590 mm (typ.)
	<b>Weight</b>	380 g (max)
	<b>Diagonal Size</b>	15.6 inch
	<b>Thickness</b>	3.2mm/ 5.2mm (PCB) (max)
	<b>Interface</b>	eDP 1.2
	<b>Surface Treatment</b>	Anti-Glare On-cell
	<b>Touch Enabled</b>	Yes <sup>1</sup>
	<b>Contrast Ratio</b>	600:1 (typ.)
	<b>Refresh Rate</b>	60 Hz
	<b>Brightness</b>	250 nits <sup>1</sup>
	<b>Pixel Resolution - Format</b>	1920 x 1080 (FHD)
	<b>Backlight</b>	LED
	<b>Pixel Resolution</b>	RGB Stripe
	<b>Color Gamut Coverage</b>	NTSC 45%
	<b>Color Depth</b>	6 bits
	<b>Viewing Angle</b>	UWVA 85/85/85/85
	<b>Low Blue Light</b>	No
	<b>Power Consumption (W, EBL@ 150nits max/ 200nits max)</b>	2.54 (Max) / 3.12 (Max)

<b>15.6 inch FHD (1920 x 1080) Anti-Glare WLED UWVA sRGB 100percent cg 400nits eDP 1.4+PSR2 bent LP NWBZ</b>	<b>Outline Dimensions (W x H)</b>	349.460 x 204.790 mm (max)
	<b>Active Area</b>	344.160 x 193.590 mm (typ.)
	<b>Weight</b>	325 g (max)
	<b>Diagonal Size</b>	15.6 inch
	<b>Thickness</b>	2.6mm / 4.6mm (PCB) (max)
	<b>Interface</b>	eDP 1.4
	<b>Surface Treatment</b>	Anti-Glare
	<b>Touch Enabled</b>	No
	<b>Contrast Ratio</b>	1200:1 (typ.)
	<b>Refresh Rate</b>	60 Hz
	<b>Brightness</b>	400 nits
	<b>Pixel Resolution - Format</b>	1920 x 1080 (FHD)
	<b>Backlight</b>	LED

### Technical Specifications

<b>Pixel Resolution</b>	RGB Stripe
<b>Color Gamut Coverage</b>	sRGB 100% (NTSC 72%)
<b>Color Depth</b>	8 bits
<b>Viewing Angle</b>	UWVA 85/85/85/85
<b>Low Blue Light</b>	No
<b>Power Consumption (W, EBL@ 150nits max/ 200nits max)</b>	1.13(Max)/1.37(Max)

**15.6 inch FHD (1920 x 1080)  
Anti-Glare WLED UWVA  
45percent cg 250nits eDP 1.2  
w/o PSR bent NWBZ**

<b>Outline Dimensions (W x H)</b>	350.960 x 205.540mm (max)
<b>Active Area</b>	344.160 x 193.590 mm (typ.)
<b>Weight</b>	370 g (max)
<b>Diagonal Size</b>	15.6 inch
<b>Thickness</b>	3.0 mm/ 5.0 mm (w/PCB) (max)
<b>Interface</b>	eDP 1.2 (2 lane)
<b>Surface Treatment</b>	Anti-Glare
<b>Touch Enabled</b>	No
<b>Contrast Ratio</b>	600:1 (typ.)
<b>Refresh Rate</b>	60 Hz
<b>Brightness</b>	250 nits
<b>Pixel Resolution - Format</b>	1920 x 1080 (FHD)
<b>Backlight</b>	LED
<b>Pixel Resolution</b>	RGB Stripe
<b>Color Gamut Coverage</b>	NTSC 45%
<b>Color Depth</b>	6 bits (Hi FRC supportive w/ condition to enable)
<b>Viewing Angle</b>	UWVA 85/85/85/85
<b>Low Blue Light</b>	No
<b>Power Consumption (W, EBL@ 150nits max/ 200nits max)</b>	2.62 (Max) / 3.27 (Max)

**15.6-in HD (1366 x 768)  
Anti-Glare WLED SVA 45percent  
cg 250nits eDP 1.2 w/o PSR  
NWBZ bent**

<b>Outline Dimensions (W x H)</b>	350.960 x 205.540 mm (max)
<b>Active Area</b>	344.230 x 193.540 mm (typ.)
<b>Weight</b>	370 g (max)
<b>Diagonal Size</b>	15.6 inch
<b>Thickness</b>	3.2 mm / 5.0 mm (w/PCB) (max)
<b>Interface</b>	eDP 1.2 (1 lane)
<b>Surface Treatment</b>	Anti-Glare
<b>Touch Enabled</b>	No
<b>Contrast Ratio</b>	300:1 (typ.)
<b>Refresh Rate</b>	60 Hz
<b>Brightness</b>	250 nits
<b>Pixel Resolution - Format</b>	1366 x 768 (HD)
<b>Backlight</b>	LED

## Technical Specifications

<b>Pixel Resolution</b>	RGB Stripe
<b>Color Gamut Coverage</b>	NTSC 45%
<b>Color Depth</b>	6 bits
<b>Viewing Angle</b>	SVA 45/45/15/35
<b>Low Blue Light</b>	No
<b>Power Consumption (W, EBL@ 150nits max/ 200nits max)</b>	2.49 (Max) / 2.78 (Max)



## Technical Specifications

## 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 and 11) is reserved for system recovery software

<b>SSD 128GB 2230 PCIe NVMe Value</b>	<b>Form Factor</b>	M.2 2230
	<b>Capacity</b>	128GB
	<b>NAND Type</b>	Value
	<b>Height</b>	0.09 in (2.3 mm)
	<b>Width</b>	0.87 in (22 mm)
	<b>Weight</b>	0.01 lb (5 g)
	<b>Interface</b>	PCIe NVMe Gen3
	<b>Maximum Sequential Read</b>	Up to 2100 MB/s
	<b>Maximum Sequential Write</b>	Up to 1200 MB/s
	<b>Logical Blocks</b>	250,069,680
	<b>Operating Temperature</b>	32° to 158°F (0° to 70°C) [ambient temp]
	<b>Features</b>	Pyrite; TRIM; L1.2

<b>SSD 256GB 2230 PCIe NVMe Value</b>	<b>Form Factor</b>	M.2 2230
	<b>Capacity</b>	256 GB
	<b>NAND Type</b>	Value
	<b>Height</b>	0.09 in (2.3 mm)
	<b>Width</b>	0.87 in (22 mm)
	<b>Weight</b>	0.02 lb (10 g)
	<b>Interface</b>	PCIe NVMe Gen3
	<b>Maximum Sequential Read</b>	up to 2500 MB/s
	<b>Maximum Sequential Write</b>	up to 1300 MB/s
	<b>Logical Blocks</b>	500,118,192
	<b>Operating Temperature</b>	32° to 158°F (0° to 70°C) [ambient temp]
	<b>Features</b>	Pyrite; TRIM; L1.2

<b>SSD 256GB 2280 PCIe NVMe Value</b>	<b>Form Factor</b>	M.2 2280
	<b>Capacity</b>	256GB
	<b>NAND Type</b>	Value
	<b>Height</b>	0.09 in (2.3 mm)
	<b>Width</b>	0.87 in (22 mm)
	<b>Weight</b>	0.02 lb (10 g)
	<b>Interface</b>	PCIe NVMe Gen3
	<b>Maximum Sequential Read</b>	Up to 2900 MB/s
	<b>Maximum Sequential Write</b>	Up to 1400 MB/s
	<b>Logical Blocks</b>	500,118,192
	<b>Operating Temperature</b>	32° to 158°F (0° to 70°C) [ambient temp]
	<b>Features</b>	ATA Security; TRIM; L1.2

## Technical Specifications

<b>SSD 256GB 2280 PCIe-4x4 NVMe Three Layer Cell</b>	<b>Form Factor</b>	M.2 2280
	<b>Capacity</b>	256 GB
	<b>NAND Type</b>	TLC
	<b>Height</b>	0.09 in (2.3 mm)
	<b>Width</b>	0.87 in (22 mm)
	<b>Weight</b>	0.02 lb (10 g)
	<b>Interface</b>	PCIe NVMe Gen4
	<b>Maximum Sequential Read</b>	Up to 6,400 MB/s
	<b>Maximum Sequential Write</b>	Up to 2,700 MB/s
	<b>Logical Blocks</b>	500,118,192
	<b>Operating Temperature</b>	32° to 158°F (0° to 70°C) [ambient temp]
	<b>Features</b>	Pyrite 2.0; TRIM; L1.2

<b>256GB PCIe-4x4 2280 NVME Self Encrypted OPAL2 Three Layer Cell Solid State Drive</b>	<b>Form Factor</b>	M.2 2280
	<b>Capacity</b>	256GB
	<b>NAND Type</b>	TLC
	<b>Height</b>	0.09 in (2.3 mm)
	<b>Width</b>	0.87 in (22 mm)
	<b>Weight</b>	0.02 lb (10 g)
	<b>Interface</b>	PCIe NVMe Gen4
	<b>Maximum Sequential Read</b>	6400
	<b>Maximum Sequential Write</b>	2700
	<b>Logical Blocks</b>	500,118,192
	<b>Operating Temperature</b>	32° to 158°F (0° to 70°C) [ambient temp]
	<b>Features</b>	ATA Security (Option); TCG Opal 2.0; TRIM; L1.2

<b>SSD 512GB 2280 PCIe NVMe Value</b>	<b>Form Factor</b>	M.2 2280
	<b>Capacity</b>	512GB
	<b>NAND Type</b>	Value
	<b>Height</b>	0.09 in (2.3 mm)
	<b>Width</b>	0.87 in (22 mm)
	<b>Weight</b>	0.02 lb (10 g)
	<b>Interface</b>	PCIe NVMe Gen3
	<b>Maximum Sequential Read</b>	Up to 3500 MB/s
	<b>Maximum Sequential Write</b>	up to 3000 MB/s
	<b>Logical Blocks</b>	1,000,215,216
	<b>Operating Temperature</b>	32° to 158°F (0° to 70°C) [ambient temp]
	<b>Features</b>	TRIM; L1.2

## Technical Specifications

<b>SSD 512GB 2280 PCIe-4x4 NVMe Three Layer Cell</b>	<b>Form Factor</b>	M.2 2280
	<b>Capacity</b>	512GB
	<b>NAND Type</b>	TLC
	<b>Height</b>	0.09 in (2.3 mm)
	<b>Width</b>	0.87 in (22 mm)
	<b>Weight</b>	0.02 lb (10 g)
	<b>Interface</b>	PCIe NVMe Gen4
	<b>Maximum Sequential Read</b>	Up to 6,600 MB/s
	<b>Maximum Sequential Write</b>	Up to 5,100 MB/s
	<b>Logical Blocks</b>	1,000,215,216
	<b>Operating Temperature</b>	32° to 158°F (0° to 70°C) [ambient temp]
	<b>Features</b>	Pyrite 2.0; TRIM; L1.2

<b>512GB PCIe-4x4 2280 NVME Self Encrypted OPAL2 Three Layer Cell Solid State Drive</b>	<b>Form Factor</b>	M.2 2280
	<b>Capacity</b>	512GB
	<b>NAND Type</b>	TLC
	<b>Height</b>	0.09 in (2.3 mm)
	<b>Width</b>	0.87 in (22 mm)
	<b>Weight</b>	0.02 lb (10 g)
	<b>Interface</b>	PCIe NVMe Gen4
	<b>Maximum Sequential Read</b>	Up to 6,600 MB/s
	<b>Maximum Sequential Write</b>	Up to 5,100 MB/s
	<b>Logical Blocks</b>	1,000,215,216
	<b>Operating Temperature</b>	32° to 158°F (0° to 70°C) [ambient temp]
	<b>Features</b>	ATA Security (Option); TCG Opal 2.0; TRIM; L1.2

<b>SSD 1TB 2280 PCIe-4x4 NVMe Three Layer Cell</b>	<b>Form Factor</b>	M.2 2280
	<b>Capacity</b>	1TB
	<b>NAND Type</b>	TLC
	<b>Height</b>	0.09 in (2.3 mm)
	<b>Width</b>	0.87 in (22 mm)
	<b>Weight</b>	0.02 lb (10 g)
	<b>Interface</b>	PCIe NVMe Gen4
	<b>Maximum Sequential Read</b>	Up to 7,100 MB/s
	<b>Maximum Sequential Write</b>	Up to 5,200 MB/s
	<b>Logical Blocks</b>	2,000,409,264
	<b>Operating Temperature</b>	32° to 158°F (0° to 70°C) [ambient temp]
	<b>Features</b>	Pyrite 2.0; TRIM; L1.2

### Technical Specifications

#### NETWORKING/COMMUNICATIONS

<b>Intel® AX211 Wi-Fi 6E + Bluetooth® 5.2 M.2 160MHz CNVi WW WLAN vPro<sup>1</sup></b>	<b>Wireless LAN Standards</b>	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
	<b>Interoperability</b>	Wi-Fi certified
	<b>Frequency Band</b>	•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 5.955 – 6.415 GHz 6.435 – 6.515 GHz 6.535 – 6.875 GHz 6.895 – 7.115 GHz
	<b>Data Rates</b>	•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: max 300Mbps •802.11ac : 1733Mbps • 802.11ax : max 2.4Gbps
	<b>Modulation</b>	Direct Sequence Spread Spectrum OFDM, BPSK, QPSK, CCK, 16-QAM, 64-QAM, 256-QAM, 1024QAM
	<b>Security<sup>3</sup></b>	•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
	<b>Network Architecture Models</b>	Ad-hoc (Peer to Peer) Infrastructure (Access Point Required)
	<b>Roaming</b>	IEEE 802.11 compliant roaming between access points
	<b>Output Power<sup>2</sup></b>	• 802.11b : +17dBm minimum

### Technical Specifications

	<ul style="list-style-type: none"> <li>• 802.11g : +16dBm minimum</li> <li>• 802.11a : +17dBm minimum</li> <li>• 802.11n HT20(2.4GHz) : +14dBm minimum</li> <li>• 802.11n HT40(2.4GHz) : +13dBm minimum</li> <li>• 802.11n HT20(5GHz) : +14dBm minimum</li> <li>• 802.11n HT40(5GHz) : +13dBm minimum</li> <li>• 802.11ac VHT80(5GHz) : +10dBm minimum</li> <li>• 802.11ac VHT160(5GHz) : +10dBm minimum</li> <li>• 802.11ax HE40(2.4GHz) : +12dBm minimum</li> <li>• 802.11ax HE80(5GHz) : +10dBm minimum</li> <li>• 802.11ax HE160(5GHz) : +10dBm minimum</li> </ul>	
<b>Power Consumption</b>	<ul style="list-style-type: none"> <li>• Transmit mode 2.0 W</li> <li>• Receive mode 1.6 W</li> <li>• Idle mode (PSP) 180 mW (WLAN Associated)</li> <li>• Idle mode 50 mW (WLAN unassociated)</li> <li>• Connected Standby 10 mW</li> <li>• Radio disabled 8 mW</li> </ul>	
<b>Power Management</b>	ACPI and PCI Express compliant power management 802.11 compliant power saving mode	
<b>Receiver Sensitivity<sup>4</sup></b>	<ul style="list-style-type: none"> <li>• 802.11b, 1 Mbps : -93.5 dBm maximum</li> <li>• 802.11b, 11 Mbps : -84 dBm maximum</li> <li>• 802.11a/g, 6 Mbps : -86 dBm maximum</li> <li>• 802.11a/g, 54 Mbps : -72 dBm maximum</li> <li>• 802.11n, MCS07 : -67 dBm maximum</li> <li>• 802.11n, MCS15 : -64 dBm maximum</li> <li>• 802.11ac, MCS0 (VHT80) : -84 dBm maximum</li> <li>• 802.11ac, MCS9 (VHT80) : -59 dBm maximum</li> <li>• 802.11ac, MCS9 (VHT160) : -58.5 dBm maximum</li> <li>• 802.11ax, MCS11 (HE40) : -57 dBm maximum</li> <li>• 802.11ax, MCS11 (HE80) : -54 dBm maximum</li> <li>• 802.11ax, MCS11 (HE160) : -53.5 dBm maximum</li> </ul>	
<b>Antenna type</b>	High efficiency antenna with spatial diversity, mounted in the display enclosure Two embedded dual band 2.4/5 GHz antennas are provided to the card to support WLAN MIMO communications and Bluetooth communications	
<b>Form Factor</b>	PCI-Express M.2 MiniCard	
<b>Dimensions</b>	1. Type 2230: 2.3 x 22.0 x 30.0 mm 2. Type 1216: 1.67 x 12.0 x 16.0 mm	
<b>Weight</b>	1. Type 2230: 2.8g 2. Type 1216: 1.3g	
<b>Operating Voltage</b>	3.3v +/- 9%	
<b>Temperature</b>	<b>Operating</b>	14° to 158° F (-10° to 70° C)
	<b>Non-operating</b>	-40° to 176° F (-40° to 80° C)
<b>Humidity</b>	<b>Operating</b>	10% to 90% (non-condensing)
	<b>Non-operating</b>	5% to 95% (non-condensing)
<b>Altitude</b>	<b>Operating</b>	0 to 10,000 ft (3,048 m)

### Technical Specifications

**Non-operating** 0 to 50,000 ft (15,240 m)

**LED Activity**

LED Amber – Radio OFF

LED OFF – Radio ON

**HP Integrated Module with Bluetooth 4.0/4.1/4.2/5.0/5.1/5.2 Wireless Technology**

**Bluetooth Specification** 4.0/4.1/4.2/5.0/5.1/5.2 Compliant

**Frequency Band** 2402 to 2480 MHz

**Number of Available** Legacy: 0~79 (1 MHz/CH)

**Channels** 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.

1. Wi-Fi 6E requires a Wi-Fi 6E router, sold separately, to function in the 6GHz band. Availability of public wireless access points limited. Wi-Fi 6E is backwards compatible with prior 802.11 specs. And available in countries where Wi-Fi 6E is supported. Wi-Fi 6E is designed to support gigabit data rate when transferring files between two devices connected to the same router. Requires a wireless router, sold separately, that supports 80MHz and higher 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

<b>Intel® AX211 Wi-Fi 6E + Bluetooth® 5.2 M.2 160MHz CNVi WW WLAN non-vPro<sup>1</sup></b>	<b>Wireless LAN Standards</b>	<ul style="list-style-type: none"> <li>IEEE 802.11a</li> <li>IEEE 802.11b</li> <li>IEEE 802.11g</li> <li>IEEE 802.11n</li> <li>IEEE 802.11ac</li> <li>IEEE 802.11ax</li> <li>IEEE 802.11d</li> <li>IEEE 802.11e</li> <li>IEEE 802.11h</li> <li>IEEE 802.11i</li> <li>IEEE 802.11k</li> <li>IEEE 802.11r</li> <li>IEEE 802.11v</li> </ul>
	<b>Interoperability</b>	Wi-Fi certified
	<b>Frequency Band</b>	<ul style="list-style-type: none"> <li>•802.11b/g/n/ax 2.402 – 2.482 GHz</li> <li>•802.11a/n/ac/ax 4.9 – 4.95 GHz (Japan)</li> <li>5.15 – 5.25 GHz</li> <li>5.25 – 5.35 GHz</li> <li>5.47 – 5.725 GHz</li> <li>5.825 – 5.850 GHz</li> <li>5.955 – 6.415 GHz</li> <li>6.435 – 6.515 GHz</li> <li>6.535 – 6.875 GHz</li> <li>6.895 – 7.115 GHz</li> </ul>
	<b>Data Rates</b>	<ul style="list-style-type: none"> <li>•802.11b: 1, 2, 5.5, 11 Mbps</li> <li>•802.11g: 6, 9, 12, 18, 24, 36, 48, 54 Mbps</li> <li>•802.11a: 6, 9, 12, 18, 24, 36, 48, 54 Mbps</li> <li>•802.11n: max 300Mbps</li> <li>•802.11ac : 1733Mbps</li> <li>•802.11ax : max 2.4Gbps</li> </ul>
	<b>Modulation</b>	Direct Sequence Spread Spectrum OFDM, BPSK, QPSK, CCK, 16-QAM, 64-QAM, 256-QAM, 1024QAM
	<b>Security<sup>3</sup></b>	<ul style="list-style-type: none"> <li>•IEEE and WiFi compliant 64 / 128 bit WEP encryption for a/b/g mode only</li> <li>•AES-CCMP: 128 bit in hardware</li> <li>•802.1x authentication</li> <li>•WPA, WPA2: 802.1x. WPA-PSK, WPA2-PSK, TKIP, and AES.</li> <li>•WPA2 certification</li> <li>•WPA3 certification</li> <li>•IEEE 802.11i</li> <li>•WAPI</li> </ul>
	<b>Network Architecture Models</b>	Ad-hoc (Peer to Peer) Infrastructure (Access Point Required)
	<b>Roaming</b>	IEEE 802.11 compliant roaming between access points
	<b>Output Power<sup>2</sup></b>	<ul style="list-style-type: none"> <li>• 802.11b : +17dBm minimum</li> <li>• 802.11g : +16dBm minimum</li> </ul>

### Technical Specifications

	<ul style="list-style-type: none"> <li>• 802.11a : +17dBm minimum</li> <li>• 802.11n HT20(2.4GHz) : +14dBm minimum</li> <li>• 802.11n HT40(2.4GHz) : +13dBm minimum</li> <li>• 802.11n HT20(5GHz) : +14dBm minimum</li> <li>• 802.11n HT40(5GHz) : +13dBm minimum</li> <li>• 802.11ac VHT80(5GHz) : +10dBm minimum</li> <li>• 802.11ac VHT160(5GHz) : +10dBm minimum</li> <li>• 802.11ax HE40(2.4GHz) : +12dBm minimum</li> <li>• 802.11ax HE80(5GHz) : +10dBm minimum</li> <li>• 802.11ax HE160(5GHz) : +10dBm minimum</li> </ul>
<b>Power Consumption</b>	<ul style="list-style-type: none"> <li>• Transmit mode 2.0 W</li> <li>• Receive mode 1.6 W</li> <li>• Idle mode (PSP) 180 mW (WLAN Associated)</li> <li>• Idle mode 50 mW (WLAN unassociated)</li> <li>• Connected Standby 10mW</li> <li>• Radio disabled 8 mW</li> </ul>
<b>Power Management</b>	ACPI and PCI Express compliant power management 802.11 compliant power saving mode
<b>Receiver Sensitivity<sup>4</sup></b>	<ul style="list-style-type: none"> <li>• 802.11b, 1Mbps : -93.5dBm maximum</li> <li>• 802.11b, 11Mbps : -84dBm maximum</li> <li>• 802.11a/g, 6Mbps : -86dBm maximum</li> <li>• 802.11a/g, 54Mbps : -72dBm maximum</li> <li>• 802.11n, MCS07 : -67dBm maximum</li> <li>• 802.11n, MCS15 : -64dBm maximum</li> <li>• 802.11ac, MCS0(VHT80) : -84dBm maximum</li> <li>• 802.11ac, MCS9(VHT80) : -59dBm maximum</li> <li>• 802.11ac, MCS9(VHT160) : -58.5dBm maximum</li> <li>• 802.11ax, MCS11(HE40) : -57dBm maximum</li> <li>• 802.11ax, MCS11(HE80) : -54dBm maximum</li> <li>• 802.11ax, MCS11(HE160) : -53.5dBm maximum</li> </ul>
<b>Antenna type</b>	High efficiency antenna with spatial diversity, mounted in the display enclosure Two embedded dual band 2.4/5 GHz antennas are provided to the card to support WLAN MIMO communications and Bluetooth communications
<b>Form Factor</b>	PCI-Express M.2 MiniCard
<b>Dimensions</b>	1. Type 2230: 2.3 x 22.0 x 30.0 mm 2. Type 1216: 1.67 x 12.0 x 16.0 mm
<b>Weight</b>	1. Type 2230: 2.8g 2. Type 1216: 1.3g
<b>Operating Voltage</b>	3.3v +/- 9%
<b>Temperature</b>	<b>Operating</b> 14° to 158° F (-10° to 70° C) <b>Non-operating</b> -40° to 176° F (-40° to 80° C)
<b>Humidity</b>	<b>Operating</b> 10% to 90% (non-condensing) <b>Non-operating</b> 5% to 95% (non-condensing)
<b>Altitude</b>	<b>Operating</b> 0 to 10,000 ft (3,048 m) <b>Non-operating</b> 0 to 50,000 ft (15,240 m)

### Technical Specifications

#### LED Activity

LED Amber – Radio OFF;  
LED Off – Radio ON

#### HP Integrated Module with Bluetooth 4.0/4.1/4.2/5.0/5.1/5.2 Wireless Technology

##### Bluetooth Specification

4.0/4.1/4.2/5.0/5.1/5.2 Compliant

##### Frequency Band

2402 to 2480 MHz

##### Number of Available Channels

Legacy: 0~79 (1 MHz/CH)  
BLE: 0~39 (2 MHz/CH)

##### Data Rates and Throughput

Legacy: 3 Mbps data rate; throughput up to 2.17 Mbps  
BLE: 1 Mbps data rate; throughput up to 0.2 Mbps  
Legacy: Synchronous Connection Oriented links up to 3, 64 kbps, voice channels  
Legacy: Asynchronous Connection Less links 2178.1 kbps/177.1 kbps asymmetric (3-DH5) or 864 kbps symmetric (3-EV5)

##### Transmit Power

The Bluetooth component shall operate as a Class II Bluetooth device with a maximum transmit power of + 9.5 dBm for BR and EDR.

1. Wi-Fi 6E requires a Wi-Fi 6E router, sold separately, to function in the 6GHz band. Availability of public wireless access points limited. Wi-Fi 6E is backwards compatible with prior 802.11 specs. And available in countries where Wi-Fi 6E is supported. Wi-Fi 6E is designed to support gigabit data rate when transferring files between two devices connected to the same router. Requires a wireless router, sold separately, that supports 80MHz and higher 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™ 7560 R+  
LTE-Advanced Pro<sup>1</sup>**

**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), 700 (Band 12 lower), 700 (Band 13 upper), 700 (Band 14 upper), 700 (Band 17 lower), 850 (Band 18 lower), 850 (Band 19 upper), 800 (Band 20), 1900 (Band 25), 850 (Band 26), 700 (Band 28), 700 (Band 29 RX only), 2300 (Band 30), 1700/2100 (Band 66), 600 (band 71).

TDD LTE: 2100 (Band 34), 2600 (Band 38), 1900 (Band 39), 2400 (Band 40), 2500 (Band 41), 3500 (Band 42), 3700 (Band 43), 3700 (band 48), 5200 (Band 46 RX only) MHz;

HSPA+: 2100 (Band 1), 1900 (Band 2), 1700/2100 (Band 4), 850 (Band 5), 900 (Band 8) MHz

**Wireless protocol  
standards**

3GPP Release 12 LTE Specification DL-CAT.16, DL 100MHz BW throughput up to 978Mbps; UL-CAT.13 40MHz throughput up to 150Mbps

WCDMA R99, 3GPP Release 5, 6, 7 and 8 UMTS Specification

**GPS**

Standalone GPS/Beidou/Glonass, 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: 978 Mbps (Download), 150 Mbps (Upload)

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**

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**

42 x 30 x 2.3 mm

**(Length x Width x  
Thickness)**

**eSIM**

Support

1. Mobile Broadband is an optional feature. Connection requires wireless data service contract, network support, and is not available in all areas. Contact service provider to determine the coverage area and availability. Connection speeds will vary due to location, environment, network conditions, and other factors. 4G LTE not available on all products or in all countries.

### Technical Specifications

<b>NXP NPC300 Near Field Communication Module</b>	<b>Dimensions (L x W x H)</b>	Module 17 mm by 10 mm by 2.0 mm
	<b>Chipset</b>	NPC300
	<b>System interface</b>	I2C
	<b>NFC RF standards</b>	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
	<b>NFC Forum Support Reader (PCD-VCD) Mode(1)</b>	Tag Type 1, Type 2, Type3 and Type 4, NFCIP-1 and NFCIP-2 ISO/IEC 14443 A ISO/IEC 14443 B ISO/IEC 15693 MIFARE 1K MIFARE 4K MIFARE DESFire FeliCa
	<b>Card Emulation (PICC-VICC) Mode(1)</b>	Jewel and Topaz cards ISO/IEC 14443 A ISO/IEC 14443 B and B' MIFARE FeliCa
	<b>Frequency</b>	13.56 MHz
	<b>NFC Modes Supported</b>	Reader/Writer, Peer-to-Peer
	<b>Raw RF Data Rates</b>	106, 212, 424, 848 kbps
	<b>Operating temperature</b>	0°C to 70°C
<b>Power Consumption (Booster enable, VBAT= 3.3V, VCC_BOOST = 5V)</b>	<b>Storage temperature</b>	-20°C to 125°C
	<b>Humidity</b>	10-90% operating 5-95% non-operating
	<b>Supply Operating voltage</b>	2.97 to 5.5 Volts
	<b>I/O Voltage</b>	1.8V or 3.3V
	<b>Mode</b>	Power Consumption, Typical
	<b>Polling</b>	7.3 mA
	<b>Detected Test Tag Type 1</b>	32.9 mA
	<b>Detected Test Tag Type 2</b>	70.7 mA
	<b>Detected Test Tag Type 3</b>	79.2 mA
	<b>Detected Test Tag Type 4</b>	64.9 mA
	<b>Antenna</b>	Antenna connector, 0.5mm pitch, 7 connector FPC. Antenna matching is external to module.

### Technical Specifications

<b>Intel® I219-LM 1 Gigabit Network Connection LOM (vPro)</b>	<b>Ethernet Features</b>	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 802.3 clauses 40) Auto-Negotiation (Automatic Speed Selection) Full Duplex Operation at all Speeds, Half Duplex operation at 10 and 100 Mbit/s
	<b>Power Management</b>	ACPI compliant – multiple power modes Situation-sensitive features reduce power consumption Advanced link down power saving for reducing link down power consumption
	<b>Performance Features</b>	TCP/IP/UDP Checksum Offload (configurable) Protocol Offload (ARP & NS) Large send offload and Giant send offload Receiving Side Scaling(Hash Mode Only) Jumbo Frame 9K
	<b>Manageability</b>	Wake-on-LAN from modern standby or sleep state (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
	<b>Interface</b> <b>NIC Device Driver Name</b>	PCI (Intel proprietary) + SMBus Intel(R) Ethernet Connection (13) I219-LM

<b>Intel® I219v 1 Gigabit Network Connection LOM (non-vPro)</b>	<b>Ethernet Features</b>	1. 10 Mbit/s operation (10BASE-T; IEEE 802.3i; IEEE 802.3 clauses 13-14) 2. 100 Mbit/s operation (100BASE-TX; IEEE 802.3u; IEEE 802.3 clauses 21-30) 3. 1000 Mbit/s operation (1000BASE-T; IEEE 802.3ab; IEEE 802.3 clauses 40) 4. Auto-Negotiation (Automatic Speed Selection) Full Duplex Operation at all Speeds, Half Duplex operation at 10, 100 & 1000 Mbit/s
	<b>Power Management</b>	ACPI compliant – multiple power modes Situation-sensitive features reduce power consumption Advanced link down power saving for reducing link down power consumption
	<b>Performance Features</b>	TCP/IP/UDP Checksum Offload (configurable) Protocol Offload (ARP & NS) Large send offload and Giant send offload Receiving Side Scaling(Hash Mode only) Jumbo Frame 9K
	<b>Manageability</b>	Wake-on-LAN from modern standby or sleep state (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
	<b>Interface</b> <b>NIC Device Driver Name</b>	PCI(Intel proprietary) + SMBus Intel(R) Ethernet Connection I219-V

### Technical Specifications

#### POWER

<b>AC Adapter 45 Watt nPFC Standard USB type C Straight 1.8m</b>	<b>Dimensions</b>	94.0 mm x 40.0 mm x 26.5 mm
	<b>Weight</b>	192.5g +/-10%
	<b>Input</b>	
	<b>Input Efficiency</b>	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%
	<b>Input frequency range</b>	47 to 63 Hz
	<b>Input AC current</b>	Max. 1.4 A at 90 Vac
	<b>Output</b>	
	<b>Output power</b>	5V/15W 9V/27W 12V/36W 15V/45W
	<b>DC output</b>	5V/9V/12V/15V
	<b>Hold-up time</b>	5ms at 115 Vac input
	<b>Output current limit</b>	<5.0A
	<b>Connector</b>	USB Type-C
	<b>Environmental Design</b>	
	<b>Operating temperature</b>	32° to 95° F (0° to 35° C)
	<b>Non-operating (storage) temperature</b>	-4° to 185° F (-20° to 85° C)
	<b>Altitude</b>	0 to 16,400 ft (0 to 5000m)
	<b>Humidity</b>	20% to 95%
	<b>Storage Humidity</b>	10% to 95%
	<b>EMI and Safety</b>	Eg.
	<b>Certifications</b>	*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.

<b>AC Adapter 45 Watt Smart nPFC Standard Barrel 4.5mm Right Angle 1.8m</b>	<b>Dimensions</b>	95 x 45 x 26.5 mm
	<b>Weight</b>	unit: 200g +/- 10g
	<b>Input</b>	
	<b>Input Efficiency</b>	87.74 % at 115 Vac and 88.4 % at 230Vac
	<b>Input frequency range</b>	47 ~ 63 Hz
	<b>Input AC current</b>	Max. 1.4 A at 90 Vac
	<b>Output</b>	
	<b>Output power</b>	45W
	<b>DC output</b>	19.5V
	<b>Hold-up time</b>	5ms at 115 Vac input

### Technical Specifications

<b>Output current limit</b>	<8.0A
<b>Connector</b>	4.5mm Barrel Type
<b>Environmental Design</b>	
<b>Operating temperature</b>	32° to 95° F (0° to 35° C)
<b>Non-operating (storage) temperature</b>	-4° to 185° F (-20° to 85° C)
<b>Altitude</b>	0 to 16,400 ft (0 to 5000m)
<b>Humidity</b>	20% to 95%
<b>Storage Humidity</b>	10% to 95%
<b>EMI and Safety Certifications</b>	Eg: *CE Mark - full compliance with LVD and EMC directives * Worldwide safety standards - IEC60950-1 and/or IEC62368-1, EN60950-1 and/or EN62368-1, UL60950-1 and/or UL62368-1, Class1, SELV; Agency approvals - C-UL-US, NORDICS, DENAN, EN55032 Class B, FCC Class B, CISPR32 Class B, CCC, NOM-001 NYCE. * MTBF - over 200,000 hours at 25°C ambient condition.

#### AC Adapter 65 Watt nPFC Standard USB type C Straight 1.8m

<b>Dimensions</b>	90.0 x 51 x 28.5mm
<b>Weight</b>	unit: 250g +/- 10g
<b>Input</b>	
<b>Input Efficiency</b>	Average Efficiency of 25%, 50%, 75%, 100% load condition with 115Vac/230Vac Spec: 5V: 81.5% 9V: 86.7% 12V: 88% 15V: 88% 20V: 89%
<b>Input frequency range</b>	47 ~ 63Hz
<b>Input AC current</b>	1.6 A at 90 VAC and maximum load
<b>Output</b>	
<b>Output power</b>	5V/15W 9V/27W 12V/60W 15V/60W 20V/65W
<b>DC output</b>	5V/9V/12V/15V/20V
<b>Hold-up time</b>	5ms at 115 Vac input
<b>Output current limit</b>	<8.0A
<b>Connector</b>	USB Type-C
<b>Environmental Design</b>	
<b>Operating temperature</b>	32° to 95° F (0° to 35° C)
<b>Non-operating (storage) temperature</b>	-4° to 185° F (-20° to 85° C)
<b>Altitude</b>	0 to 16,400 ft (0 to 5000m)
<b>Humidity</b>	20% to 95%

### Technical Specifications

<b>Storage Humidity</b>	10% to 95%
<b>EMI and Safety</b>	Eg:
<b>Certifications</b>	*CE Mark - full compliance with LVD and EMC directives * Worldwide safety standards - IEC60950-1 and/or IEC62368-1, EN60950-1 and/or EN62368-1, UL60950-1 and/or UL62368-1 , Class1, SELV; Agency approvals - C-UL-US, NORDICS, DENAN, EN55032 Class B, FCC Class B, CISPR32 Class B, CCC, NOM-001 NYCE. * MTBF - over 200,000 hours at 25°C ambient condition.

#### AC Adapter 65 Watt Smart nPFC EM Barrel 4.5mm New EM

<b>Dimensions</b>	102 x 55 x 30mm
<b>Weight</b>	unit: 250g +/- 10g
<b>Input</b>	
<b>Input Efficiency</b>	88.0 % at 115 Vac and 89.0 % at 230Vac
<b>Input frequency range</b>	47 ~ 63 Hz
<b>Input AC current</b>	Max. 1.7 A at 90 Vac
<b>Output</b>	
<b>Output power</b>	65W
<b>DC output</b>	19.5V
<b>Hold-up time</b>	5ms at 115 Vac input
<b>Output current limit</b>	<11.0A
<b>Connector</b>	4.5mm Barrel Type
<b>Environmental Design</b>	
<b>Operating temperature</b>	32°F to 95°F (0°to 35°C)
<b>Non-operating (storage) temperature</b>	-4°F to 185°F (-20°to 85°C)
<b>Altitude</b>	0 to 16,400 ft (0 to 5000m)
<b>Humidity</b>	20% to 95%
<b>Storage Humidity</b>	10% to 95%
<b>EMI and Safety</b>	Eg:
<b>Certifications</b>	*CE Mark - full compliance with LVD and EMC directives * Worldwide safety standards - IEC60950-1 and/or IEC62368-1, EN60950-1 and/or EN62368-1, UL60950-1 and/or UL62368-1 , Class1, SELV; Agency approvals - C-UL-US, NORDICS, DENAN, EN55032 Class B, FCC Class B, CISPR32 Class B, CCC, NOM-001 NYCE. * MTBF - over 200,000 hours at 25°C ambient condition.

### Technical Specifications

<b>AC Adapter 65 Watt Smart nPFC Standard Barrel 4.5mm Right Angle 1.8m</b>	<b>Dimensions</b>	90 x 51 x 28.5mm
	<b>Weight</b>	230g +/-10%
	<b>Input</b>	
	<b>Input Efficiency</b>	88.0 % at 115 Vac and 89.0 % at 230 Vac
	<b>Input frequency range</b>	47 ~ 63 Hz
	<b>Input AC current</b>	Max. 1.7 A at 90 Vac
	<b>Output</b>	
	<b>Output power</b>	65W
	<b>DC output</b>	19.5V
	<b>Hold-up time</b>	5 ms at 115 Vac input
	<b>Output current limit</b>	<11.0A
	<b>Connector</b>	4.5mm Barrel Type
	<b>Environmental Design</b>	
	<b>Operating temperature</b>	32°F to 95°F (0° to 35°C)
	<b>Non-operating (storage) temperature</b>	-4°F to 185°F (-20° to 85°C)
	<b>Altitude</b>	0 to 16,400 ft (0 to 5000m)
	<b>Humidity</b>	20% to 95%
	<b>Storage Humidity</b>	10% to 95%
	<b>EMI and Safety</b>	Eg:
	<b>Certifications</b>	*CE Mark - full compliance with LVD and EMC directives * Worldwide safety standards - IEC60950-1 and/or IEC62368-1, EN60950-1 and/or EN62368-1, UL60950-1 and/or UL62368-1, Class1, SELV; Agency approvals - C-UL-US, NORDICS, DENAN, EN55032 Class B, FCC Class B, CISPR32 Class B, CCC, NOM-001 NYCE. * MTBF - over 200,000 hours at 25°C ambient condition.

<b>RH 42Whr<sup>1</sup> Long Life Polymer Fast Charge<sup>2</sup> 3 cell Battery</b>	<b>Dimensions (H x W x L)</b>	6.2 x 76.25 x 249.50 mm (0.244 x 3.002 x 9.823 inch)
	<b>Weight</b>	0.18 kg (0.397 lb)
	<b>Cells/Type</b>	3cell Lithium-Ion Polymer cell / 545974
	<b>Energy</b>	
	<b>Voltage</b>	11.4V
	<b>Amp-hour capacity</b>	3.752Ah
	<b>Watt-hour capacity</b>	42.75Wh
	<b>Temperature</b>	
	<b>Operating (Charging)</b>	32° to 113° F (0° to 45° C)
	<b>Operating (Discharging)</b>	14° to 122° F (-10° to 60° C)
	<b>Fuel Gauge LED</b>	NA
	<b>Warranty</b>	Follow Product Spec.
	<b>Optional Travel Battery Available</b>	No

1. 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.

### Technical Specifications

2. Recharges your battery 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.

<b>RH 51Whr<sup>1</sup> Long Life Polymer Fast Charge<sup>2</sup> 3 cell Battery</b>	<b>Dimensions (H x W x L)</b>	6.50 x 67.80 x 254.00 mm (0.256 x 2.669 x 10 inch)
	<b>Weight</b>	0.2025 kg (0.446 lb)
	<b>Cells/Type</b>	3cell Lithium-Ion Polymer cell / 566075
	<b>Energy</b>	
	<b>Voltage</b>	11.58V
	<b>Amp-hour capacity</b>	4.431Ah
	<b>Watt-hour capacity</b>	51.3Wh
	<b>Temperature</b>	
	<b>Operating (Charging)</b>	32° to 113° F (0° to 45° C)
	<b>Operating (Discharging)</b>	14° to 122° F (-10° to 60° C)
	<b>Fuel Gauge LED</b>	NA
	<b>Warranty</b>	Follow Product Spec.
	<b>Optional Travel Battery Available</b>	No

1. 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.

2. Recharges your battery 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

### Technical Specifications

#### AUDIO

<b>HD Stereo Codec</b>	ALC3247-CG
<b>Audio I/O Ports</b>	Headset: CTIA only and Headphone-out
<b>Internal Speaker Amplifier</b>	ALC 3247 has Embedded Class-D 2W Stereo Amplifier
<b>Multi-streaming Capable</b>	Playback multi-streaming can be enabled in the audio control panel to allow independent audio. Following MSFT Behavior
<b>Sampling</b>	DAC:44.1k/48kHz ADC:48kHz
<b>Wavetable Syntheses</b>	NA
<b>Analog Audio</b>	Support 3.5mm Headset: CTIA only and Headphone-out
<b># of Channels on Line-Out</b>	NA
<b>Internal Speaker</b>	Yes

#### FINGERPRINT READER

<b>Sensor vendor</b>	Elan efsa80ST
<b>Sensor type</b>	Capacitive
<b>DPI resolution</b>	508 dpi
<b>Scan area</b>	80*80 pixels
<b>False Rejection Rate</b>	<3%
<b>False Acceptance Rate</b>	1/100K
<b>Mobile Voltage Operation</b>	2.7V to 3.6V
<b>Operating Temperature</b>	-4 – 175°F (-20° ~ +80°C)
<b>Current Consumption</b>	
<b>Image</b>	50mA peak
<b>Low Latency Wait For Finger</b>	900uA
<b>Capture Rate</b>	30 frame/sec
<b>ESD Resistance</b>	+15KV
<b>Detection Matrix</b>	80*80 pixels/ 508 dpi / 4*4mm sensor area

## Technical Specifications

## ENVIRONMENTAL DATA

<b>Eco-Label Certifications &amp; declarations</b>	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: <ul style="list-style-type: none"><li>• IT ECO declaration</li><li>• US ENERGY STAR®</li><li>• US Federal Energy Management Program (FEMP)</li><li>• EPEAT<sup>®</sup> Gold registered in the United States. See <a href="http://www.epeat.net">http://www.epeat.net</a> for registration status in your country.</li><li>• TCO Certified</li><li>• China Energy Conservation Program (CECP)</li><li>• China State Environmental Protection Administration (SEPA)</li><li>• Taiwan Green Mark</li><li>• Korea Eco-label</li><li>• Japan PC Green label*</li></ul>		
<b>Sustainable Specifications</b>	<b>Impact</b>	<ul style="list-style-type: none"><li>• Ocean-bound plastic in Speaker</li><li>• 10% post-consumer recycled plastic</li><li>• Low halogen</li><li>• Outside Box and corrugated cushions are 100% sustainably sourced and recyclable</li><li>• Molded Paper Pulp Cushion inside box is 100% sustainably sourced and recyclable</li><li>• Bulk packaging available</li></ul>	
<b>System Configuration</b>	The configuration used for the Energy Consumption and Declared Noise Emissions data for the Notebook model is based on a “Typically Configured Notebook”.		
<b>Energy Consumption (in accordance with US ENERGY STAR® test method)</b>	<b>115VAC, 60Hz</b>	<b>230VAC, 50Hz</b>	<b>100VAC, 50Hz</b>
Normal Operation (Sort idle)	4.28 W	4.36 W	4.37 W
Normal Operation (Long idle)	1.25 W	1.37 W	1.25 W
Sleep	1.25 W	1.37 W	1.25 W
Off	0.3 W	0.35 W	0.31 W
	Note: Energy efficiency data listed is for an ENERGY STAR® compliant product if offered within the model family. HP computers marked with the ENERGY STAR® Logo are compliant with the applicable U.S. Environmental Protection Agency (EPA) ENERGY STAR® specifications for computers. If a model family does not offer ENERGY STAR® compliant configurations, then energy efficiency data listed is for a typically configured PC featuring a hard disk drive, a high efficiency power supply, and a Microsoft Windows® operating system.		
<b>Heat Dissipation*</b>	<b>115VAC, 60Hz</b>	<b>230VAC, 50Hz</b>	<b>100VAC, 50Hz</b>
Normal Operation (Short idle)	14.6 BTU/hr	14.9 BTU/hr	14.9 BTU/hr
Normal Operation (Long idle)	4.3 BTU/hr	4.7 BTU/hr	4.3 BTU/hr
Sleep	4.3 BTU/hr	4.7 BTU/hr	4.3 BTU/hr

### Technical Specifications

Off	1 BTU/hr	1.2 BTU/hr	1.1 BTU/hr
	*NOTE: Heat dissipation is calculated based on the measured watts, assuming the service level is attained for one hour.		
<b>Declared Noise Emissions (in accordance with ISO 7779 and ISO 9296)</b>	Sound Power (L <sub>WAd</sub> , bels)	Sound Pressure (L <sub>pAm</sub> , decibels)	
Typically Configured – Idle	2.6	13.7	
Fixed Disk – Random writes	2.8	21.2	
Optical Drive – Sequential reads	3.8	32.6	
<b>Longevity and Upgrading</b>	This product can be upgraded, possibly extending its useful life by several years. Upgradeable features and/or components contained in the		
	Spare parts are available throughout the warranty period and or for up to “5” years after the end of production.		
<b>Additional Information</b>	<ul style="list-style-type: none"><li>• This product is in compliance with the Restrictions of Hazardous Substances (RoHS) directive - 2011/65/EC.</li><li>• This HP product is designed to comply with the Waste Electrical and Electronic Equipment (WEEE) Directive – 2002/96/EC.</li><li>• This product is in compliance with California Proposition 65 (State of California; Safe Drinking Water and Toxic Enforcement Act of 1986).</li><li>• This product is in compliance with the IEEE 1680 (EPEAT) standard at the Gold level, see <a href="http://www.epeat.net">www.epeat.net</a></li><li>• Plastics parts weighing over 25 grams used in the product are marked per ISO11469 and ISO1043.</li><li>• This product is 93.3% recycle-able when properly disposed of at end of life.</li></ul>		
<b>Packaging Materials</b>	<b>External:</b>	PAPER/Corrugated	295 g
		PAPER/Molded Pulp	192 g
	<b>Internal:</b>	PLASTIC/Polyethylene low density - LDPE	10 g
	The plastic packaging material contains at least 0.0% recycled content.		
	The corrugated paper packaging materials contains at least 60.6% recycled content.		
<b>RoHS Compliance</b>	<p>HP Inc. complies fully with materials regulations. We were among the first companies to extend the restrictions in the European Union (EU) Restriction of Hazardous Substances (RoHS) Directive to our products worldwide through the HP GSE. HP has contributed to the development of related legislation in Europe, as well as China, India, and Vietnam.</p> <p>We believe the RoHS directive and similar laws play an important role in promoting industry-wide elimination of substances of concern. We have supported the inclusion of additional substances—including PVC, BFRs, and certain phthalates—in future RoHS legislation that pertains to electrical and electronics products.</p> <p>We met our voluntary objective to achieve worldwide compliance with the new EU RoHS requirements for virtually all relevant products by July 2013, and we will continue to extend the scope of the commitment to include further restricted substances as regulations continue to evolve.</p> <p>To obtain a copy of the HP RoHS Compliance Statement, see <a href="#">HP RoHS position statement</a>.</p>		

### Technical Specifications

<b>Material Usage</b>	<p>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 <a href="http://www.hp.com/hpinfo/globalcitizenship/environment/supplychain/gen_specifications.html">http://www.hp.com/hpinfo/globalcitizenship/environment/supplychain/gen_specifications.html</a>):</p> <ul style="list-style-type: none"> <li>• Asbestos</li> <li>• Certain Azo Colorants</li> <li>• Certain Brominated Flame Retardants – may not be used as flame retardants in plastics</li> <li>• Cadmium</li> <li>• Chlorinated Hydrocarbons</li> <li>• Chlorinated Paraffins</li> <li>• Bis(2-Ethylhexyl) phthalate (DEHP)</li> <li>• Benzyl butyl phthalate (BBP)</li> <li>• Dibutyl phthalate (DBP)</li> <li>• Diisobutyl phthalate (DIBP)</li> <li>• Formaldehyde</li> <li>• Halogenated Diphenyl Methanes</li> <li>• Lead carbonates and sulfates</li> <li>• Lead and Lead compounds</li> <li>• Mercuric Oxide Batteries</li> <li>• Nickel – finishes must not be used on the external surface designed to be frequently handled or carried by the user.</li> <li>• Ozone Depleting Substances</li> <li>• Polybrominated Biphenyls (PBBs)</li> <li>• Polybrominated Biphenyl Ethers (PBEBs)</li> <li>• Polybrominated Biphenyl Oxides (PBBOs)</li> <li>• Polychlorinated Biphenyl (PCB)</li> <li>• Polychlorinated Terphenyls (PCT)</li> <li>• Polyvinyl Chloride (PVC) – except for wires and cables, and certain retail packaging has been voluntarily removed from most applications.</li> <li>• Radioactive Substances</li> <li>• Tributyl Tin (TBT), Triphenyl Tin (TPT), Tributyl Tin Oxide (TBTO)</li> </ul>
<b>Packaging Usage</b>	<p>HP follows these guidelines to decrease the environmental impact of product packaging:</p> <ul style="list-style-type: none"> <li>• Eliminate the use of heavy metals such as lead, chromium, mercury and cadmium in packaging materials.</li> <li>• Eliminate the use of ozone-depleting substances (ODS) in packaging materials.</li> <li>• Design packaging materials for ease of disassembly.</li> <li>• Maximize the use of post-consumer recycled content materials in packaging materials.</li> <li>• Use readily recyclable packaging materials such as paper and corrugated materials.</li> <li>• Reduce size and weight of packages to improve transportation fuel efficiency.</li> <li>• Plastic packaging materials are marked according to ISO 11469 and DIN 6120 standards.</li> </ul>

### Technical Specifications

<b>End-of-life Management and Recycling</b>	<p>HP offers end-of-life HP product return and recycling programs in many geographic areas. To recycle your product, please go to: <a href="http://www.hp.com/go/reuse-recycle">http://www.hp.com/go/reuse-recycle</a> or contact your nearest HP sales office. Products returned to HP will be recycled, recovered or disposed of in a responsible manner.</p> <p>The EU WEEE directive (2002/95/EC) requires manufacturers to provide treatment information for each product type for use by treatment facilities. This information (product disassembly instructions) is posted on the Hewlett Packard web site at: <a href="http://www.hp.com/go/recyclers">http://www.hp.com/go/recyclers</a>. 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.</p>
<b>HP, Inc. Corporate Environmental Information</b>	<p>For more information about HP's commitment to the environment:</p> <p>Global Citizenship Report  <a href="http://www.hp.com/hpinfo/globalcitizenship/gcreport/index.html">http://www.hp.com/hpinfo/globalcitizenship/gcreport/index.html</a></p> <p>Eco-label certifications  <a href="http://www8.hp.com/us/en/hp-information/environment/ecolabels.html">http://www8.hp.com/us/en/hp-information/environment/ecolabels.html</a></p> <p>ISO 14001 certificates:  <a href="http://h20195.www2.hp.com/V2/GetDocument.aspx?docname=c04755842">http://h20195.www2.hp.com/V2/GetDocument.aspx?docname=c04755842</a>  and  <a href="http://www.hp.com/hpinfo/globalcitizenship/environment/pdf/cert.pdf">http://www.hp.com/hpinfo/globalcitizenship/environment/pdf/cert.pdf</a></p>
<b>footnotes</b>	<ul style="list-style-type: none"> <li>• Percentage of ocean-bound plastic contained in each component varies by product</li> <li>• Recycled plastic content percentage is based on the definition set in the IEEE 1680.1-2018 standard.</li> <li>• External power supplies, WWAN modules, power cords, cables and peripherals excluded.</li> <li>• 100% outer box packaging and corrugated cushions made from sustainably sourced certified and recycled fibers.</li> <li>• Fiber cushions made from 100% recycled wood fiber and organic materials.</li> </ul>

### COUNTRY OF ORIGIN

China

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

#### DOCKING (Sold Separately)

<b>Docking station model #1</b>	HP USB-C Dock G5
<b>Total number of supported displays (incl.the notebook display)</b>	3
<b>Max.resolutions supported</b>	Dual 5K@ 30Hz + 1 4K UHD (multi-function mode) 5120x2880
<b>Dock Connectors</b>	1xHDMI, 2xDP
<b>Technical limitations</b>	<p>Highest resolution with dual displays is two 8K@ 60Hz host in High Resolution mode.</p> <p>Three maximum displays supported are two 5K@ 30 Hz on DP ports plus one 4K UHD@ 30 Hz on HDMI in Multi-function mode</p> <p>The highest resolution for a non-Thunderbolt host in Multi-function mode is a single 5K dual cable (using both DP ports) + (1) 4K on HDMI port.</p>
<b>Docking station model #2</b>	HP USB-C/A Universal Dock G2
<b>Total number of supported displays (incl.the notebook display)</b>	3
<b>Max.resolutions supported</b>	Triple 4K UHD@ 60Hz 3840x2160
<b>Dock Connectors</b>	1xHDMI, 2xDP
<b>Technical limitations</b>	<p>The best resolution for dual or triple displays is 4K UHD@ 60Hz.</p> <p>For use with the USB-A adapter that comes in the box the maximum number of displays supported is (2) 4k x 60 Hz on the Type-A Gen 1 connection from the host</p>
<b>Docking station model #3</b>	HP Thunderbolt Dock G2
<b>Total number of supported displays (incl.the notebook display)</b>	4
<b>Max.resolutions supported</b>	<p>Dual 4K @30Hz or dual 4K UHD @ 60Hz is supported</p> <p>Dual 8K@ 60Hz for TB hosts or USB-C hosts DP 1.4 with DSC in high res mode</p> <p>2xDP, 1xVGA, 1xTB, 1xUSB-C alt-mode</p>
<b>Dock Connectors</b>	Thunderbolt Hosts:
<b>Technical limitations</b>	<p>Maximum of (4) displays with maximum resolution of 5K@ 30Hz running Thunderbolt host.</p> <p>Maximum resolution possible is dual 8K displays @ 60Hz running Thunderbolt host or running a non-Thunderbolt host in high resolution mode @30Hz</p> <p>Non-Thunderbolt hosts:</p> <p>The highest resolution for dual displays running a non-Thunderbolt host in multi-function mode is</p> <p>(1) 5K dual cable (using both DP ports) +(1) 4K on USB-C DP port</p> <p>Non-Thunderbolt hosts support (3) displays with a maximum resolution of (2) 5K single cable + (1) 4K UHD @ 60 Hz in high resolution mode. In multi-function mode the maximum resolution for (3) displays is (2) 5K single cable @ 30Hz + (1) 4K UHD @ 30Hz.</p>

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

Category	Description	Part Number
<b>Audio/Video</b>	HP Wired USB-A Stereo Headset	428K6AA
	HP Wired 3.5mm Stereo Headset	428K7AA
<b>Cases</b>	HP Business Slim 17.3 Top Load	2UW02AA
	HP Executive 15.6 Backpack	6KD07AA
	HP Executive 15.6 Top Load	6KD06AA
	HP Executive 17.3 Backpack	6KD05AA
	HP Executive 17.3 Top Load	6KD08AA
	HP Executive Leather 15.6 Top Load	6KD09AA
	HP Prelude G2 15.6 Backpack	1E7D6AA
	HP Prelude G2 15.6 Top Load	1E7D7AA
	HP Prelude Pro Recycled 15.6 Backpack	1X644AA
	HP Prelude Pro Recycled 15.6 Top Load	1X645AA
	HP Renew Business 17.3 Laptop Backpack	3E2U5AA
	HP Renew Business 17.3 Laptop Bag	3E2U6AA
	HP Renew Business 15.6 Laptop Bag	3E5F8AA
<b>Docking</b>	HP Thunderbolt 120W G2 Dock	2UK37AA
	HP Thunderbolt 120W G2 Dock w/Audio	3YE87AA
	HP Thunderbolt 120W G4 Dock	4J0A2AA
	HP Thunderbolt 230W G2 Dock w/Combo Cable	3TR87AA
	HP Thunderbolt 280W G4 Dock w/Combo Cable	4J0G4AA
	HP USB-C/A 120W G2 Universal Dock	5TW13AA
	HP USB-C 120W G5 Dock	26D32AA
<b>Hub</b>	HP USB-C Mini Dock	1PM64AA
	HP Universal USB-C Multiport Hub	50H55AA
	HP USB-C Travel Dock G2	7PJ38AA
	HP USB-C to USB-A Hub	Z6A00AA
<b>Adapter</b>	HP HDMI to DVI Adapter	F5A28AA
	HP HDMI to VGA Adapter	H4F02AA
	HP USB-C to DisplayPort Adapter	N9K78AA
	HP USB-C to HDMI 2.0 Adapter	N7P47AA
	HP USB-C to USB 3.0 Adapter	1WC36AA
	HP USB-C to VGA Adapter	N9K76AA
<b>Keyboard/Combo</b>	HP 975 USB+BT Dual-Mode Wireless Keyboard	3Z726AA
	HP 455 Programmable Wireless Keyboard	4R177AA
	HP 125 WD USB Keyboard	266C9AA
	HP 320K WD USB Keyboard	9SR37AA
	HP 655 Wireless Keyboard and Mouse Combo	4R009AA
	HP 225 Wired Mouse and Keyboard Combo	286J4AA

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

	HP 235 Wireless Mouse and Keyboard Combo	1Y4D0AA
	HP Slim Wireless Keyboard and Mouse	T6L04AA
	HP Wired Desktop 320MK Mouse and Keyboard	9SR36AA
	HP Wireless Rechargeable 950MK Mouse and Keyboard	3M165AA
<b>Mouse</b>	HP USB Premium Wireless Mouse	1JR31AA
	HP 435 Multi-Device Wireless Mouse	3B4Q5AA
	HP 125 USB-A Wired Mouse	265A9AA
	HP 128 USB Laser Wired Mouse	265D9AA
	HP 320M USB-A Wired Mouse	9VA80AA
	HP Creator USB-A+Bluetooth 935 Wireless Mouse Black	1D0K8AA
	HP USB-A+Bluetooth Multi-Device 635 Wireless Mouse Black	1D0K2AA
	HP USB-A+Bluetooth Travel Bluetooth Mouse	6SP30AA
<b>Power</b>	HP 65W USB-C Auto Chevy AC Power Adapter	5TQ76AA
	HP 45W 4.5 mm Smart AC Power Adapter	H6Y88AA
	HP 45W USB-C G2 Zeus AC Power Adapter	1HE07AA
	HP 45W USB-C LC Dali AC Power Adapter	1MZ01AA
	HP 65W 4.5 mm LC Smart non-EM India Only AC Power Adapter	3FF84AA#ACJ
	HP 65W 4.5 mm Smart AC Power Adapter	H6Y89AA
	HP 65W 4.5 mm wDongle 7.4 mm Slim AC Power Adapter	H6Y82AA
	HP 65W USB-C Hades AC Power Adapter	1HE08AA
	HP 65W USB-C LC AC Power Adapter	1P3K6AA
<b>Commodity</b>	HP USB DVD-Writer EXT ODD	F2B56AA
	HP Nano Keyed Cable Lock	1AJ39AA
	HP Nano Master Keyed Cable Lock	1AJ40AA
	HP SureKey Standard/Nano/Wedge Cable Lock	6UW42AA

### Summary of Changes

Date of change:	Version History:	Updated	Description of change:
April 11, 2022	V1 to V2	Added	Environmental Data and Reference for USB ports
May 13, 2022	V2 to V3	Updated	Battery life
June 6, 2022	V3 to V4	Added	RJ-45 disclaimer in overview and ports section; Manageability disclaimer
June 22, 2022	V4 to V5	Updated	Discrete in Graphics section

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