

### Overview

#### HP ProBook 650 G8 Notebook PC



#### Left

- |                             |  |
|-----------------------------|--|
| 1. Internal Microphones (2) | 6. Clickpad  |
| 2. Webcam LED (Optional)    | 7. Smart Card Reader (Optional)                    |
| 3. HD Camera (Optional)     | 8. SuperSpeed USB Type-A 5Gbps signaling rate Port |
| 4. Camera Privacy Shutter   | 9. RJ-45   |
| 5. IR Camera                | 10. Nano Security Lock Slot (Lock sold separately) |



### Overview



#### Right

- |  |   |
|--|---|
| 1. Power Button Key                                  | 6. HDMI Port (Cable not included)           |
| 2. Power Connector                                   | 7. Audio Combo Jack                         |
| 3. SuperSpeed USB Type-C® 10Gbps signaling rate Port | 8. SIM Card Slot (Optional)                 |
| 4. SuperSpeed USB Type-A 5Gbps signaling rate Port   | 9. Touch Fingerprint Sensor (select models) |
| 5. SuperSpeed USB Type-A 5Gbps signaling rate Port   |   |



### Overview

#### At a Glance

- New mechanical design - Smaller footprint and Light weight
- Powerful quad core 11<sup>th</sup> Gen Intel® Core™ U-Series with SIPP CPU option
- NVidia® GeForce MX450 graphics solution (Optional)
- HP Sure View Gen3 panel
- Physical HP Privacy Camera (Optional)
- Gigabit class 4G LTE wireless broadband (Optional)
- HP Fast Charge - Charge up to 50% in 30 minutes
- Wi-Fi 6 capability (Optional)
- Multi Factor Authentication - IR camera Hardened fingerprint sensor (Optional)
- Rich IO ports with charging USB
- Responsiveness w/Modern Standby and Wake on Fingerprint Sensor (Optional)
- Backlit keyboard option and new programmable key
- Nice range of display option from HD, FHD, all the way to SureView option
- Passed 19 MIL STD 810H tests<sup>1</sup>

1. MIL-STD 810H is not intended to demonstrate fitness of U.S. Department of Defense contract requirements or for military use. Test results are not a guarantee of future performance under these test conditions. Accidental damage requires an optional HP Accidental Damage Protection Care Pack.

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

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## Technical Specifications

### PRODUCT NAME

HP ProBook 650 G8 Notebook PC

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### OPERATING SYSTEMS

#### Preinstalled

Windows 10 Pro 64 – HP recommends Windows 10 Pro<sup>1</sup>  
Windows 10 Pro 64 (National Academic only)<sup>2</sup>  
Windows 10 Home 64<sup>1</sup>  
Windows 10 Home Single Language 64<sup>1</sup>  
Windows 10 Pro (Windows 10 Enterprise available with a Volume Licensing Agreement)<sup>1</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, which is always enabled. ISP fees may apply and additional requirements may apply over time for updates. See <http://www.windows.com>.

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

Note: Your product does not support Windows 8 or Windows 7. In accordance with Microsoft's support policy, HP does not support the Windows® 8 or Windows 7 operating system on products configured with Intel® and AMD® 7th generation and forward processors or provide any Windows® 8 or Windows 7 drivers on <http://www.support.hp.com>. A full list of HP products and the Windows 10 versions tested is available on the HP support website. <https://support.hp.com/us-en/document/c05195282>.

#### Supported Version

HP tested Windows 10, version 1809 on this platform For testing information on newer versions of Windows10, please see: <https://support.hp.com/document/c05195282>.

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### PROCESSORS

Intel® Core™ i7-1185G7 processor (Up to 4.8 GHz with Intel® Turbo Boost Technology, 12 MB L3 cache, 4 cores)<sup>3,4 5,6</sup>  
Intel® Core™ i7-1165G7 processor (Up to 4.7 GHz with Intel® Turbo Boost Technology, 12 MB L3 cache, 4 cores)<sup>3,4 5,6</sup>  
Intel® Core™ i5-1145G7 processor (Up to 4.4 GHz with Intel® Turbo Boost Technology, 8 MB L3 cache, 4 cores)<sup>3,4 5,6</sup>  
Intel® Core™ i5-1135G7 processor (Up to 4.2 GHz with Intel® Turbo Boost Technology, 8 MB L3 cache, 4 cores)<sup>3,4 5,6</sup>  
Intel® Core™ i3-1115G4 processor with Intel® UHD Graphics (Up to 4.1 GHz with Intel® Turbo Boost Technology, 6 MB L3 cache, 2 cores)<sup>3,4 5,6</sup>

#### Processors Family

11th Generation Intel® Core™ i7 processor (i7-1165G7 & i7-1185G7)<sup>7</sup>  
11th Generation Intel® Core™ i5 processor (i5-1135G7 & i5-1145G7)<sup>7</sup>  
11th Generation Intel® Core™ i3 processor (i3-1115G4)<sup>7</sup>

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



### Technical Specifications

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. Max Boost clock frequency performance varies depending on hardware, software and overall system configuration.

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

### CHIPSET

Chipset is integrated with processor

### GRAPHICS

#### Integrated

Intel® Iris® X<sup>e</sup> Graphics (Core i5 and Core i7)<sup>43</sup>

Intel® UHD Graphics (Core i3)<sup>8</sup>

#### Discrete

NVIDIA® GeForce® MX450 (2 GB DDR5 dedicated)

#### Supports

Support HD decode, DX12, HDMI 1.4b

8. HD content required to view HD images.

43. 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.

### DISPLAYS

#### Internal

##### Non-Touch

39.6 cm (15.6") diagonal HD SVA eDP anti-glare narrow bezel bent, 250 nits, 45% NTSC (1366 x 768)<sup>8,10</sup>

39.6 cm (15.6") diagonal HD SVA eDP anti-glare narrow bezel bent, 250 nits, 45% NTSC for HD camera (1366 x 768)<sup>8,10</sup>

39.6 cm (15.6") diagonal FHD UWVA eDP anti-glare narrow bezel bent, 250 nits, 45% NTSC (1920 x 1080)<sup>8,10</sup>

39.6 cm (15.6") diagonal FHD UWVA eDP anti-glare narrow bezel bent, 250 nits, 45% NTSC for HD camera (1920 x 1080)<sup>8,10</sup>

39.6 cm (15.6") diagonal FHD UWVA eDP anti-glare narrow bezel bent, 250 nits, 45% NTSC for HD camera and WWAN (1920 x 1080)<sup>8,10</sup>

39.6 cm (15.6") diagonal FHD UWVA eDP anti-glare narrow bezel bent, 250 nits, 45% NTSC for HD + IR camera and WWAN (1920 x 1080)<sup>8,10</sup>

39.6 cm (15.6") diagonal FHD UWVA eDP anti-glare Low Power narrow bezel bent, 400 nits, 100% sRGB for HD camera and WWAN (1920 x 1080)<sup>8,10</sup>

39.6 cm (15.6") diagonal FHD UWVA eDP anti-glare Low Power narrow bezel bent, 400 nits, 100% sRGB for HD + IR camera and WWAN (1920 x 1080)<sup>8,10</sup>

39.6 cm (15.6") diagonal FHD IPS eDP+PSR anti-glare flat with HP Sure View Gen3 Integrated Privacy Screen, 1000 nits, 72% NTSC for HD+IR camera and WWAN (1920 x 1080)<sup>8,9,10,11,46</sup>



### Technical Specifications

#### Touch

39.6 cm (15.6") diagonal FHD SVA eDP narrow bezel bent touch-on-panel screen, 250 nits, 45% NTSC for HD camera (1920 x 1080) <sup>8,9,10,46</sup>

39.6 cm (15.6") diagonal FHD SVA eDP narrow bezel bent touch-on-panel screen, 250 nits, 45% NTSC for HD + IR camera and WWAN (1920 x 1080) <sup>8,9,10,46</sup>

#### HDMI

Supports resolutions up to 4K 30Hz

8. HD content required to view HD images.

9. Sold separately or as an optional feature.

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

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

46. Actual brightness will be lower with HP Sure View or touch screen.

| Dockingstation model       | Total number of supported displays (incl. the notebook display) | Max. resolutions supported  | Dock Connectors                     | Technical limitations                                   |
|----------------------------|---|---|-------------------------------------|---|
| HP Thunderbolt Dock G2     | 3   | Dual 4K @ 60Hz  | 2xDP, 1xVGA, 1xTB, 1xUSB-C alt-mode | System only runs at alt-mode speed                      |
| HP Elite USB-C Dock G5     | 3   | Three 1680x1050 @ 60 Hz<br>Dual 2K @ 60Hz<br>Single 4K @ 60Hz (3840 x 1440) | 1xHDMI, 2xDP                        |   |
| HP USB-C Universal Dock G2 | 3   | Dual 4K @ 60Hz<br>Single 5K @ 60Hz  | 1xHDMI, 2xDP                        |   |
| HP USB-C Travel Dock       | 2   | Single 2K @ 60Hz  | 1xHDMI, 1xVGA                       | Single external display<br>Only HDMI or VGA at the time |



## Technical Specifications

### STORAGE AND DRIVES

#### Primary M.2 Storage

- 128 GB PCIe® NVMe™ M.2 TLC Solid State Drive<sup>12</sup>
- 256 GB PCIe® NVMe™ M.2 Value Solid State Drive<sup>12</sup>
- 256 GB PCIe® NVMe™ M.2 TLC Solid State Drive<sup>12</sup>
- 256 GB PCIe® NVMe™ M.2 TLC Solid State Drive (Opal 2)<sup>12</sup>
- 512 GB PCIe® NVMe™ M.2 TLC Solid State Drive<sup>12</sup>
- 512 GB PCIe® NVMe™ M.2 Value Solid State Drive<sup>12</sup>
- 512 GB PCIe® Gen3x4 NVMe™ M.2 SED SSD TLC<sup>12</sup>
- 512 GB Intel® PCIe® NVMe™ QLC M.2 SSD with 32 GB Intel® Optane™ memory H10<sup>12,45</sup>
- 1 TB PCIe® NVMe™ M.2 TLC Solid State Drive<sup>12</sup>

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

45. Intel® Optane™ H10 memory system acceleration does not replace or increase the DRAM in your system. Requires 8th Gen or higher Intel® Core™ processor, BIOS version with Intel® Optane™ supported, Windows 10 64-bit, and an Intel® Rapid Storage Technology (Intel® RST) driver.

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### MEMORY<sup>44</sup>

#### Maximum Memory

64 GB DDR4-3200 SDRAM<sup>13</sup>

#### Memory

- 64 GB DDR4-3200 SDRAM (2 x 32 GB)<sup>13</sup>
- 32 GB DDR4-3200 SDRAM (1 x 32 GB)<sup>13</sup>
- 32 GB DDR4-3200 SDRAM (2 x 16 GB)<sup>13</sup>
- 16 GB DDR4-3200 SDRAM (1 x 16 GB)<sup>13</sup>
- 16 GB DDR4-3200 SDRAM (2 x 8 GB)<sup>13</sup>
- 12 GB DDR4- 3200 SDRAM (4 GB and 8 GB (1 x 8 GB)<sup>13</sup>
- 8 GB DDR4-3200 SDRAM (1 x 8 GB)<sup>13</sup>
- 8 GB DDR4-3200 SDRAM (2 x 4 GB)<sup>13</sup>
- 4 GB DDR4-3200 SDRAM (1 x 4 GB)<sup>13</sup>

#### Memory Slots

2 SODIMM

Both slots are customer accessible / upgradeable

DDR4 PC4 SODIMMS, (Tiger Lake runs at 3200)

Supports Dual Channel Memory

13. 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.

44. 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.





### Technical Specifications

#### NETWORKING/COMMUNICATIONS

##### WLAN

Intel Wi-Fi 6 AX201 + BT5 (802.11ax 2x2, vPro, supporting gigabit file transfer speeds)<sup>14</sup>

Intel® Dual Band Wireless-AC 9560 802.11a/b/g/n/ac (2x2) WLAN and Bluetooth® 5 Combo, non-vPro™<sup>14</sup>

Intel® Dual Band Wi-Fi 6 AX201 802.11a/b/g/n/ac (2x2) WLAN and Bluetooth® 5 Combo, non-vPro™<sup>14</sup>

##### WWAN

Intel® XMM™ 7360 LTE-Advanced (Cat9)<sup>15</sup>

##### NFC

NFC Mirage WNC XRAV-1

##### Ethernet

Intel 10/100/1000 NIC<sup>16</sup>

14. Wireless access point and internet service required and sold separately. Availability of public wireless access points limited. Wi-Fi 5 (802.11 ac) is backwards compatible with prior 802.11 specs.

15. WWAN module is optional, must be configured at the factory and requires separately purchased service contract. Check with service provider for coverage and availability in your area. Connection speeds will vary due to location, environment, network conditions, and other factors. 4G LTE not available on all products, in all regions.

16. 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.

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#### AUDIO/MULTIMEDIA

##### Audio

2 Integrated stereo speakers (70dB)

Integrated microphone (Dual Array)

##### Camera

720p HD Camera<sup>8</sup>

720p HD Camera+IR Camera<sup>8,9</sup>

8. HD content required to view HD images.

9. 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

**Pointing Device**

Clickpad with multi-touch gesture support

**Function Keys**

F1 - Display Switching

F2 - Blank or SureView On/Off

F3 - Brightness Down

F4 - Brightness Up

F5 - Audio Mute

F6 - Volume Down

F7 - Volume Up

F8 - Mic Mute

F9 - Blank or Backlit Toggle

F10 - Insert

F11 - Airplane mode

F12 - Programmable key

**Hidden Function Keys**

Fn+R - Break

Fn+S - Sys Rq

Fn+C - Scroll Lock

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#### SOFTWARE AND SECURITY

**Preinstalled Software**

HP BIOSphere Gen5 <sup>17</sup>

NVMe Driverlock

BIOS Update (Status) Over Wi-fi

Power On Authentication

HP Secure Erase <sup>19</sup>

Absolute Persistence Module <sup>20</sup>

HP LAN-Wireless Protection

Pre-Boot Security

**Software**

HP Connection Optimizer <sup>18</sup>

HP Image Assistant

HP Hotkey Support

myHP

HP Support Assistant <sup>21</sup>

HP Noise Cancellation Software

HSA Fusion for Commercial

HSA Telemetry for Commercial

Touchpoint Customizer for Commercial

HP Notifications



### Technical Specifications

HP Privacy Settings  
HP Wireless Button Driver  
HP Power Manager

#### Manageability Features

HP Driver Packs (download) <sup>22</sup>  
HP Manageability Integration Kit Gen3 (download) <sup>23</sup>  
HP System Software Manager (SSM) (download)  
HP BIOS Config Utility (BCU) (download)  
HP Client Catalog (download)  
HP Client Management Script Library (download)

#### Client Security Software

HP Client Security Manager Gen7 <sup>24</sup>  
Windows Defender <sup>25</sup>

#### Security Management

Pre-Boot Security  
USB enable/disable (via BIOS)  
Power-on password (via BIOS)  
Setup password (via BIOS)  
HP Fingerprint Sensor <sup>26</sup>  
Support for chassis padlocks and cable lock devices  
HP Pro Security Edition (Select models) <sup>43</sup>  
HP Sure Click <sup>27</sup>  
HP Sure Sense <sup>28</sup>  
HP Sure Start Gen6 <sup>29</sup>  
HP Sure Admin <sup>30</sup>  
HP Sure Recover Gen4 <sup>31</sup>  
HP Sure Run Gen4 <sup>32</sup>  
TPM 2.0 Embedded Security Chip shipped with Windows 10 (Common Criteria EAL4+ Certified) (FIPS 140-2 Level 2 Certified) <sup>33</sup>

#### Security

##### TPM

Model: Infineon SLB9670  
Version: 7.85  
Revision: TPM 2.0  
FIPS 140-2 Compliant: Yes

##### Smartcard Reader

Model number: Alcor AU9560  
FIPS 201 Compliant: Yes

##### IPv6 Compliance

Yes

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

Yes

UEFI version: 2.7

17. HP BIOSphere Gen5 is available on select HP Pro and Elite PCs. See product specifications for details. Features may vary depending on the platform and configurations.



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## Technical Specifications

18. HP Connection Optimizer requires Windows 10.
19. HP Secure Erase For the methods outlined in the National Institute of Standards and Technology Special Publication 800-88 "Clear" sanitation method. HP Secure Erase does not support platforms with Intel® Optane™.
20. Absolute firmware module is shipped turned off and can only be activated with the purchase a license subscription and full activation of the software agent. License subscriptions can be purchased for terms ranging multiple years. Service is limited, check with Absolute for availability outside the U.S. Certain conditions apply. For full details visit: <https://www.absolute.com/about/legal/agreements/absolute/>.
21. HP Support Assistant requires Windows and Internet access.
22. HP Driver Packs not preinstalled, however available for download at <http://www.hp.com/go/clientmanagement>.
23. HP Manageability Integration Kit can be downloaded from <http://www.hp.com/go/clientmanagement>.
24. HP Client Security Manager Gen6 requires Windows and is available on the select HP Pro and Elite PCs.
25. Windows Defender Opt in and internet connection required for updates.
26. HP Fingerprint sensor is an optional feature that must be configured at purchase.
27. HP Sure Click requires Windows 10 Pro or Enterprise. See [https://bit.ly/2PrLT6A\\_SureClick](https://bit.ly/2PrLT6A_SureClick) for complete details.
28. HP Sure Sense requires Windows 10.
29. HP Sure Start Gen6 is available on select HP PCs.
30. 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.
31. HP Sure Recover Gen3 is available on select HP PCs and requires an open network connection. You must back up important files, data, photos, videos, etc. before using HP Sure Recover to avoid loss of data.
32. HP Sure Run Gen3 is available on select Windows 10 based HP Pro, Elite and Workstation PCs with select Intel® or AMD processors.
33. Firmware TPM is version 2.0.
43. HP Pro Security Edition is available preloaded on select HP PCs and includes HP Sure Click Pro and HP Sure Sense Pro. 3-year license required. The HP Pro Security Edition software is licensed under the license terms of the HP End User License Agreement (EULA) that can be found at: [https://h30670.www3.hp.com/eccommerce/common/disclaimer.do#EN\\_US](https://h30670.www3.hp.com/eccommerce/common/disclaimer.do#EN_US) as modified by the following: "7. Term. Unless otherwise terminated earlier pursuant to the terms contained in this EULA, the license for the HP Pro Security Edition (HP Sure Sense Pro and HP Sure Click Pro) is effective upon activation and will continue for thirty-six (36) months thereafter ("Initial Term"). At the end of the Initial Term you may either (a) purchase a renewal license for the HP Pro Security Edition from HP.com, HP Sales or an HP Channel Partner, or (b) continue using the standard versions of HP Sure Click and HP Sure Sense at no additional cost with no future software updates or HP Support." HP Pro Security Edition is optimized for the SMB environment and ships pre-configured - manageability is optional. The HP Pro Security Edition supports a limited tool set that can be used by the HP Manageability Integration Kit which can be downloaded from <http://www.hp.com/go/clientmanagement>.



### Technical Specifications

#### POWER

**Power Supply**<sup>16</sup>

HP Smart 65 W External AC power adapter <sup>34</sup>  
HP Smart 65 W EM External AC power adapter <sup>34</sup>  
HP Smart 65 W USB Type-C® adapter <sup>34</sup>  
HP Smart 45 W External AC power adapter <sup>34</sup>  
HP Smart 45 W USB Type-C® adapter <sup>34</sup>

**Primary Battery**

HP Long Life 3-cell, 45 Wh Polymer <sup>35</sup>

**Power Cord**

3-wire plug - 1m <sup>34</sup>  
2-wire plug - 1m <sup>34</sup>

**Battery life**

MM18: Up to 12 hours and 30 minutes

**Battery Weight**

190 g

[34. Availability may vary by country.](#)

[35. Battery is internal and not replaceable by customer. Serviceable by warranty.](#)

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#### WEIGHTS & DIMENSIONS

**Product Weight**<sup>36</sup>

Starting at 3.82 lb  
Starting at 1.74 kg

**Product Dimensions (w x d x h)**

14.14 x 9.2 x 0.78 in  
35.94 x 23.39 x 1.99 cm

[36. Weight will vary by configuration.](#)

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### Technical Specifications

#### PORTS/SLOTS

##### Ports

- 1 HDMI 1.4b <sup>37</sup>
- 1 Headphone/microphone combo jack
- 1 AC power
- 1 Nano SIM (optional)
- 1 RJ-45

##### USB Ports

| Processor Type                                    | Type-C® Port  | Type-A Port  |
|---|---|--|
| Transactional + Multifunction version (non-vPro®) | 1 SuperSpeed USB Type-C® 10 Gbps signaling rate Port (USB Power Delivery, DisplayPort™)                     | 2 SuperSpeed USB Type-A 5Gbps signaling rate Port (1 Powered port)<br>1 SuperSpeed USB Type-A 5Gbps signaling rate Port (Power delivery) |
| Transactional + Thunderbolt version (non-vPro®)   | 1 Thunderbolt™ 4 with USB4™ Type-C® 40 Gbps signaling rate (USB Power Delivery, DisplayPort™)               | 2 SuperSpeed USB Type-A 5Gbps signaling rate Port (1 Powered port)<br>1 SuperSpeed USB Type-A 5Gbps signaling rate Port (Power delivery) |
| vPro®   | 1 Thunderbolt™ 4 with USB4™ Type-C® 40 Gbps signaling rate (USB Power Delivery, DisplayPort™) <sup>47</sup> | 2 SuperSpeed USB Type-A 5Gbps signaling rate Port (1 Powered port)<br>1 SuperSpeed USB Type-A 5Gbps signaling rate Port (Power delivery) |

##### Expansion Slots

- 1 Smart Card Reader (optional)

<sup>37</sup>. HDMI cable sold separately.

<sup>47</sup>. SuperSpeed USB 20Gbps is not available with Thunderbolt™ 4.



### Technical Specifications

#### SERVICE AND SUPPORT

HP Services offers 1-year and 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>38</sup>

38. 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

|                                     |                                  |
|-------------------------------------|----------------------------------|
| <b>Energy Efficiency Compliance</b> | ENERGY STAR® certified           |
| <b>Energy Efficiency Compliance</b> | EPEAT® 2019 Silver <sup>39</sup> |
| <b>Environmental Specifications</b> | Low halogen <sup>40</sup>        |
| <b>Environmental Specifications</b> | TCO NB 8.0 Certification         |

39. Based on US EPEAT® registration according to IEEE 1680.1-2018 EPEAT®. Status varies by country. Visit <http://www.epeat.net> for more information.

40. 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 | 19 V                        |
| Average Operating Power   | 4.86W                       |
| Integrated graphics       | Yes                         |
| Discrete Graphics         | N185-G5 : 25W               |
| Max Operating Power       | Discrete < 65W<br>UMA < 45W |

#### Temperature

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

#### Relative Humidity

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

#### Shock

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

#### Random Vibration

|               |           |
|---------------|-----------|
| Operating     | 0.75 grms |
| Non-operating | 1.50 grms |

#### Altitude (unpressurized)

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

#### Planned Industry Standard Certifications

|                                 |  |
|---------------------------------|--|
| UL                              | Yes                                    |
| CSA                             | Yes                                    |
| FCC Compliance                  | Yes                                    |
| ENERGY STAR®                    | Select models <sup>41</sup>            |
| EPEAT®                          | EPEAT® 2019 Gold in U.S. <sup>42</sup> |
| ICES                            | Yes                                    |
| Australia /                     | Yes                                    |
| NZ A – Tick Compliance          | Yes                                    |
| CCC                             | Yes                                    |
| Japan VCCI Compliance           | Yes                                    |
| KC                              | Yes                                    |
| BSMI                            | Yes                                    |
| CE Marketing Compliance         | Yes                                    |
| BNCI or BELUS                   | Yes                                    |
| CIT                             | Yes                                    |
| GOST                            | Yes                                    |
| Saudi Arabian Compliance (ICCP) | Yes                                    |





## Technical Specifications

SABS

Yes

41. Configurations of the HP ProBook 650 G8 that are ENERGY STAR® certified are identified as HP ProBook 650 G8 ENERGY STAR on HP websites and on <http://www.energystar.gov>.

42. Based on US EPEAT® registration according to IEEE 1680.1-2018 EPEAT®. EPEAT® status varies by country. Visit [www.epeat.net](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 HP Sure View or touch screen.

|   |                                       |   |
|---|---------------------------------------|---|
| <b>Panel LCD 15.6 inch FHD (1920x1080) Anti-Glare WLED UWVA 45% NTSC 250 nits eDP 1.2 w/o PSR bent NWBZ</b> | <b>Outline Dimensions (W x H x D)</b> | 350.96 x 205.54 mm (max)                          |
|   | <b>Active Area</b>                    | 344.16 x 193.59 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</b>               | 1920 x 1080 (FHD)                                 |
|   | <b>Format</b>                         | RGB Stripe  |
|   | <b>Backlight</b>                      | LED   |
|   | <b>Color Gamut Coverage</b>           | 45% of NTSC                                       |
|   | <b>Color Depth</b>                    | 6 bits (Hi FRC supportive w/ condition to enable) |
|   | <b>Viewing Angle</b>                  | UWVA 85/85/85/85                                  |

|   |                                       |                           |
|---|---------------------------------------|---------------------------|
| <b>Panel LCD 15.6 inch FHD (1920x1080) Anti-Glare WLED UWVA 45% NTSC 250nits eDP 1.2 w/o PSR bent Touch on Panel NWBZ</b> | <b>Outline Dimensions (W x H x D)</b> | 350.96 x 205.74 mm (max)  |
|   | <b>Active Area</b>                    | 344.16 x 193.59 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                       |
|   | <b>Contrast Ratio</b>                 | 600:1 (typ.)              |
|   | <b>Refresh Rate</b>                   | 60 Hz                     |
|   | <b>Brightness<sup>1</sup></b>         | 250 nits*                 |
|   | <b>Pixel Resolution</b>               | 1920 x 1080 (FHD)         |



### Technical Specifications

|                             |                  |
|-----------------------------|------------------|
| <b>Format</b>               | RGB Stripe       |
| <b>Backlight</b>            | LED              |
| <b>Color Gamut Coverage</b> | 45% of NTSC      |
| <b>Color Depth</b>          | 6 bits           |
| <b>Viewing Angle</b>        | UWVA 85/85/85/85 |

**Panel LCD 15.6 inch FHD (1920x1080) Anti-Glare WLED UWVA sRGB 100 percent cg 400nits eDP 1.4+PSR2 bent LP NWBZ**

|                                       |                           |
|---------------------------------------|---------------------------|
| <b>Outline Dimensions (W x H x D)</b> | 349.46 x 204.79 mm (max)  |
| <b>Active Area</b>                    | 344.16 x 193.59 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</b>               | 1920 x 1080 (FHD)         |
| <b>Format</b>                         | RGB Stripe                |
| <b>Backlight</b>                      | LED                       |
| <b>Color Gamut Coverage</b>           | sRGB 100%                 |
| <b>Color Depth</b>                    | 8 bit                     |
| <b>Viewing Angle</b>                  | UWVA 85/85/85/85          |

**Panel LCD 15.6 inch FHD (1920x1080) Anti-Glare WLED UWVA 72 percent cg 1000nits eDP 1.4+PSR2 PrivacyG3 NWBZ bent**

|                                       |                               |
|---------------------------------------|-------------------------------|
| <b>Outline Dimensions (W x H x D)</b> | 349.52x205.39 mm (max)        |
| <b>Active Area</b>                    | 344.16 x 193.59 mm (typ.)     |
| <b>Weight</b>                         | 350 g (max)                   |
| <b>Diagonal Size</b>                  | 15.6 inch                     |
| <b>Thickness</b>                      | 2.6mm / 4.5mm Max. (PCB side) |
| <b>Interface</b>                      | eDP 1.4 + PSR (4 lane)        |
| <b>Surface Treatment</b>              | Anti-Glare                    |
| <b>Touch Enabled</b>                  | No                            |
| <b>Contrast Ratio</b>                 | 2000:1 (typ.)                 |
| <b>Refresh Rate</b>                   | 60 Hz                         |
| <b>Brightness</b>                     | 1000 nits*                    |
| <b>Pixel Resolution</b>               | 1920 x 1080 (FHD)             |
| <b>Format</b>                         | RGB                           |
| <b>Backlight</b>                      | LED                           |
| <b>Color Gamut Coverage</b>           | sRGB 100%                     |
| <b>Color Depth</b>                    | 8 bits                        |
| <b>Viewing Angle</b>                  | UWVA 85/85/85/85              |



### Technical Specifications

|  |                                       |  |
|--|---------------------------------------|--|
| <b>Panel LCD 15.6-in HD (1366x768) Anti-Glare WLED SVA 45% NTSC 250 nits eDP 1.2 w/o PSR NWBZ bent</b> | <b>Outline Dimensions (W x H x D)</b> | 350.96 x 205.54 (mm) max               |
|  | <b>Active Area</b>                    | 344.23 x 193.54 mm (typ.)              |
|  | <b>Weight</b>                         | 370 g max                              |
|  | <b>Diagonal Size</b>                  | 15.6"                                  |
|  | <b>Thickness</b>                      | 3.2mm (panel) / 5.0mm (panel+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>                     | 250nits                                |
|  | <b>Pixel Resolution</b>               | 1366 x 768 (HD)                        |
|  | <b>Format</b>                         | RGB                                    |
|  | <b>Backlight</b>                      | LED                                    |
|  | <b>Color Gamut Coverage</b>           | 45% of NTSC                            |
| <b>Color Depth</b>   | 6 bits                                |  |
| <b>Viewing Angle</b>   | SVA 45/45/15/35                       |  |



### Technical Specifications

#### STORAGE AND DRIVES<sup>1</sup>

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

|   |                          |  |
|---|--------------------------|--|
| <b>SSD 128GB 2280 PCIe-3x2<br/>Three Layer Cell</b> | Form Factor              | M.2 2280                                 |
|   | Capacity                 | 128 GB                                   |
|   | NAND Type                | TLC                                      |
|   | Height                   | 0.09 in (2.3 mm)                         |
|   | Width                    | 0.87 in (22 mm)                          |
|   | Weight                   | 0.02 lb (10 g)                           |
|   | Interface                | PCIe NVMe                                |
|   | Maximum Sequential Read  | 1400 ~ 2100 MB/s                         |
|   | Maximum Sequential Write | 800 ~ 1200 MB/s                          |
|   | Logical Blocks           | 250,069,680                              |
|   | Operating Temperature    | 32° to 158°F (0° to 70°C) [ambient temp] |
|   | Features                 | ATA Security; DIPM; TRIM; DEVSLP         |

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

|   |                         |                  |
|---|-------------------------|------------------|
| <b>SSD 256GB 2280 PCIe NVMe<br/>Value</b> | Form Factor             | M.2 2280         |
|   | Capacity                | 256 GB           |
|   | NAND Type               | Value            |
|   | Height                  | 0.09 in (2.3 mm) |
|   | Width                   | 0.87 in (22 mm)  |
|   | Weight                  | 0.02 lb (10 g)   |
|   | Interface               | PCIe NVMe Gen3   |
|   | Maximum Sequential Read | 2100 ~ 2200 MB/s |



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 Technical Specifications

|                          |  |
|--------------------------|--|
| Maximum Sequential Write | 900 ~ 1400 MB/s                          |
| Logical Blocks           | 500,118,192                              |
| Operating Temperature    | 32° to 158°F (0° to 70°C) [ambient temp] |
| Features                 | ATA Security (optional); TRIM; L1.2      |

**SSD 512GB 2280 PCIe NVMe**  
**Value**

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

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

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

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

|             |                  |
|-------------|------------------|
| Form Factor | M.2 2280         |
| Capacity    | 512 GB           |
| NAND Type   | TLC              |
| Height      | 0.09 in (2.3 mm) |
| Width       | 0.87 in (22 mm)  |
| Weight      | 0.02 lb (10 g)   |
| Interface   | PCIe NVMe Gen3X4 |



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 Technical Specifications

|                          |  |
|--------------------------|--|
| Maximum Sequential Read  | 3100 ~ 3500 MB/s                         |
| Maximum Sequential Write | 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                 |

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

|                          |  |
|--------------------------|--|
| Form Factor              | M.2 2280                                 |
| Capacity                 | 256 GB                                   |
| NAND Type                | TLC                                      |
| Height                   | 0.09 in (2.3 mm)                         |
| Width                    | 0.87 in (22 mm)                          |
| Weight                   | 0.02 lb (10 g)                           |
| Interface                | PCIe NVMe Gen3X4                         |
| Maximum Sequential Read  | 2800 ~ 3500 MB/s                         |
| Maximum Sequential Write | 1400 ~ 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                 |

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**SSD 256GB 2280 PCIe-3x4 NVMe Self Encrypted OPAL2 Three Layer Cell**

|                          |   |
|--------------------------|---|
| Form Factor              | M.2 2280  |
| Capacity                 | 256 GB  |
| NAND Type                | TLC   |
| Height                   | 0.09 in (2.3 mm)                                |
| Width                    | 0.87 in (22 mm)                                 |
| Weight                   | 0.02 lb (10 g)                                  |
| Interface                | PCIe NVMe Gen3X4                                |
| Maximum Sequential Read  | 2800 ~ 3500 MB/s                                |
| Maximum Sequential Write | 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 |

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### Technical Specifications

|  |                          |   |
|--|--------------------------|---|
| <b>SSD 512GB 2280 PCIe-3x4<br/>NVMe Self Encrypted OPAL2<br/>Three Layer</b> | Form Factor              | M.2 2280  |
|  | Capacity                 | 512 GB  |
|  | NAND Type                | TLC   |
|  | Height                   | 0.09 in (2.3 mm)                                |
|  | Width                    | 0.87 in (22 mm)                                 |
|  | Weight                   | 0.02 lb (10 g)                                  |
|  | Interface                | PCIe NVMe Gen3X4                                |
|  | Maximum Sequential Read  | 3100 ~ 3500 MB/s                                |
|  | Maximum Sequential Write | 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 |





## Technical Specifications

## NETWORKING/COMMUNICATIONS

|  |                                    |  |
|--|------------------------------------|--|
| <b>Intel Wi-Fi 6 AX201 + Bluetooth® 5 (802.11ax 2x2, vPro, supporting gigabit file transfer speeds) <sup>5,6</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>            | Features Wi-Fi 6 technology  |
|  | <b>Frequency Band</b>              | <ul style="list-style-type: none"> <li>• 802.11b/g/n/ax<br/>2.402 – 2.482 GHz</li> <li>• 802.11a/n/ac/ax<br/>4.9 – 4.95 GHz (Japan)<br/>5.15 – 5.25 GHz<br/>5.25 – 5.35 GHz<br/>5.47 – 5.725 GHz<br/>5.825 – 5.850 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: MCS 0 ~ MCS 15, (20MHz, and 40MHz)</li> <li>• 802.11ac: MCS0 ~ MCS9, (1SS, and 2SS) (20MHz, 40MHz, 80MHz &amp; 160MHz)</li> <li>• 802.11ax: MCS0 ~ MCS11, (1SS and 2SS) (20MHz, 40MHz, 80MHz &amp; 160MHz)</li> </ul> |
|  | <b>Modulation</b>                  | Direct Sequence Spread Spectrum<br>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 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)<br>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: +18.5dBm minimum</li> <li>• 802.11g: +17.5dBm minimum</li> </ul>   |



### Technical Specifications

|   |  |                  |                               |                      |                                |
|---|--|------------------|-------------------------------|----------------------|--------------------------------|
|   | <ul style="list-style-type: none"> <li>• 802.11a: +18.5dBm minimum</li> <li>• 802.11n HT20(2.4GHz): +15.5dBm minimum</li> <li>• 802.11n HT40(2.4GHz): +14.5dBm minimum</li> <li>• 802.11n HT20(5GHz): +15.5dBm minimum</li> <li>• 802.11n HT40(5GHz): +14.5dBm minimum</li> <li>• 802.11ac VHT80(5GHz): +11.5dBm minimum</li> <li>• 802.11ac VHT160(5GHz): +11.5dBm minimum</li> <li>• 802.11ax HT40(2.4GHz): +10dBm minimum</li> <li>• 802.11ax VHT160(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/Modern 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>3</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: -84dBm maximum</li> <li>• 802.11ac, MCS9: -59dBm maximum</li> <li>• 802.11ax, MCS11(HT40): -59dBm maximum</li> <li>• 802.11ax, MCS11(VHT160): -58.5dBm maximum</li> </ul> |                  |                               |                      |                                |
| <b>Antenna type</b>                     | <p>High efficiency antenna with spatial diversity, mounted in the display enclosure</p> <p>Two embedded dual band 2.4/5 GHz antennas are provided to the card to support WLAN MIMO communications and Bluetooth communications</p>   |                  |                               |                      |                                |
| <b>Form Factor</b>                      | PCI-Express M.2 MiniCard with CNVi Interface   |                  |                               |                      |                                |
| <b>Dimensions</b>                       | <ol style="list-style-type: none"> <li>1. Type 2230: 2.3 x 22.0 x 30.0 mm</li> <li>2. Type 1216: 1.67 x 12.0 x 16.0 mm</li> </ol>  |                  |                               |                      |                                |
| <b>Weight</b>                           | <ol style="list-style-type: none"> <li>1. Type 2230: 2.8 g</li> <li>2. Type 126: 1.3 g</li> </ol>  |                  |                               |                      |                                |
| <b>Operating Voltage</b>                | 3.3v +/- 9%  |                  |                               |                      |                                |
| <b>Temperature</b>                      | <table> <tbody> <tr> <td><b>Operating</b></td> <td>14° to 158° F (-10° to 70° C)</td> </tr> <tr> <td><b>Non-operating</b></td> <td>-40° to 176° F (-40° to 80° C)</td> </tr> </tbody> </table>   | <b>Operating</b> | 14° to 158° F (-10° to 70° C) | <b>Non-operating</b> | -40° to 176° F (-40° to 80° C) |
| <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>                         | <table> <tbody> <tr> <td><b>Operating</b></td> <td>10% to 90% (non-condensing)</td> </tr> <tr> <td><b>Non-operating</b></td> <td>5% to 95% (non-condensing)</td> </tr> </tbody> </table>   | <b>Operating</b> | 10% to 90% (non-condensing)   | <b>Non-operating</b> | 5% to 95% (non-condensing)     |
| <b>Operating</b>                        | 10% to 90% (non-condensing)  |                  |                               |                      |                                |
| <b>Non-operating</b>                    | 5% to 95% (non-condensing)   |                  |                               |                      |                                |
| <b>Altitude</b>                         | <table> <tbody> <tr> <td><b>Operating</b></td> <td>0 to 10,000 ft (3,048 m)</td> </tr> <tr> <td><b>Non-operating</b></td> <td>0 to 50,000 ft (15,240 m)</td> </tr> </tbody> </table>   | <b>Operating</b> | 0 to 10,000 ft (3,048 m)      | <b>Non-operating</b> | 0 to 50,000 ft (15,240 m)      |
| <b>Operating</b>                        | 0 to 10,000 ft (3,048 m)   |                  |                               |                      |                                |
| <b>Non-operating</b>                    | 0 to 50,000 ft (15,240 m)  |                  |                               |                      |                                |
| <b>LED Activity</b>                     | <p>LED Amber – Radio OFF</p> <p>LED Off – Radio ON</p>   |                  |                               |                      |                                |

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



## Technical Specifications

|  |  |
|--|--|
| <b>Bluetooth Specification</b>         | 4.0/4.1/4.2/5.0/5.1 Compliant  |
| <b>Frequency Band</b>                  | 2402 to 2480 MHz   |
| <b>Number of Available Channels</b>    | Legacy: 0~79 (1 MHz/CH)<br>BLE: 0~39 (2 MHz/CH)  |
| <b>Signaling Data Rate</b>             | Legacy: 3 Mbps signaling data rate <sup>1</sup> 2.17 Mbps<br>BLE: 1 Mbps signaling data rate <sup>1</sup> 0.2 Mbps<br><a href="#">1. Actual throughput may vary.</a>   |
| <b>Transmit Power</b>                  | Legacy: Synchronous Connection Oriented links up to 3, 64 kbps, voice channels<br>Legacy: Asynchronous Connection Less links 2178.1 kbps/177.1 kbps asymmetric (3-DH5) or 864 kbps symmetric (3-EV5)<br>The Bluetooth component shall operate as a Class II Bluetooth device with a maximum transmit power of + 9.5 dBm for BR and EDR.  |
| <b>Power Consumption</b>               | Peak (Tx) 330 mW<br>Peak (Rx) 230 mW<br>Selective Suspend 17 mW  |
| <b>Bluetooth Software Supported</b>    | Microsoft Windows Bluetooth Software   |
| <b>Link Topology</b>                   |  |
| <b>Power Management</b>                | Microsoft Windows ACPI, and USB Bus Support  |
| <b>Certifications</b>                  | FCC (47 CFR) Part 15C, Section 15.247 & 15.249   |
| <b>Power Management Certifications</b> | ETS 300 328, ETS 300 826<br>Low Voltage Directive IEC950<br>UL, CSA, and CE Mark   |
| <b>Bluetooth Profiles Supported</b>    | BT4.1-ESR 5/6/7 Compliance<br>LE Link Layer Ping<br>LE Dual Mode<br>LE Link Layer<br>LE Low Duty Cycle Directed Advertising<br>LE L2CAP Connection Oriented Channels<br>Train Nudging & Interlaced Scan<br>BT4.2 ESR08 Compliance<br>LE Secure Connection- Basic/Full<br>LE Privacy 1.2 –Link Layer Privacy<br>LE Privacy 1.2 –Extended Scanner Filter Policies<br>LE Data Packet Length Extension<br>FAX Profile (FAX)<br>Basic Imaging Profile (BIP) <sup>2</sup><br>Headset Profile (HSP)<br>Hands Free Profile (HFP)<br>Advanced Audio Distribution Profile (A2DP) |

- [1. Wireless access point and Internet service is required. Availability of public wireless access point is limited.](#)
- [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.](#)



### Technical Specifications

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).
5. Wi-Fi supporting gigabit speeds is achievable when transferring files between two devices connected to the same router. Requires a wireless router, sold separately, that supports 160MHz channels.
6. 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.

|  |                               |  |
|--|-------------------------------|--|
| <b>Intel Wi-Fi 6 AX201 + Bluetooth® 5 (802.11ax 2x2, non-vPro, supporting gigabit file transfer speeds)<sup>5,6</sup> Non-vPro</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>       | Features Wi-Fi 6 technology  |
|  | <b>Frequency Band</b>         | <ul style="list-style-type: none"> <li>• 802.11b/g/n/ax<br/>2.402 – 2.482 GHz</li> <li>• 802.11a/n/ac/ax<br/>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> </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: MCS 0 ~ MCS 15, (20MHz, and 40MHz)</li> <li>• 802.11ac: MCS0 ~ MCS9, (1SS, and 2SS) (20MHz, 40MHz, 80MHz &amp; 160MHz)</li> <li>• 802.11ax: MCS0 ~ MCS11, (1SS and 2SS) (20MHz, 40MHz, 80MHz &amp; 160MHz)</li> </ul> |
|  | <b>Modulation</b>             | Direct Sequence Spread Spectrum<br>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 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> </ul>   |



## Technical Specifications

|   |  |
|---|--|
|   | <ul style="list-style-type: none"><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)<br>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: +18.5dBm minimum</li><li>• 802.11g: +17.5dBm minimum</li><li>• 802.11a: +18.5dBm minimum</li><li>• 802.11n HT20(2.4GHz): +15.5dBm minimum</li><li>• 802.11n HT40(2.4GHz): +14.5dBm minimum</li><li>• 802.11n HT20(5GHz): +15.5dBm minimum</li><li>• 802.11n HT40(5GHz): +14.5dBm minimum</li><li>• 802.11ac VHT80(5GHz): +11.5dBm minimum</li><li>• 802.11ac VHT160(5GHz): +11.5dBm minimum</li><li>• 802.11ax HT40(2.4GHz): +10dBm minimum</li><li>• 802.11ax VHT160(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/Modern 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>3</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: -84dBm maximum</li><li>• 802.11ac, MCS9: -59dBm maximum</li><li>• 802.11ax, MCS11(HT40): -59dBm maximum</li><li>• 802.11ax, MCS11(VHT160): -58.5dBm maximum</li></ul>  |
| <b>Antenna type</b>                     | High efficiency antenna with spatial diversity, mounted in the display enclosure<br>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 with CNVi Interface   |
| <b>Dimensions</b>                       | 1. Type 2230: 2.3 x 22.0 x 30.0 mm<br>2. Type 1216: 1.67 x 12.0 x 16.0 mm  |
| <b>Weight</b>                           | 1. Type 2230: 2.8 g<br>2. Type 1216: 1.3 g   |
| <b>Operating Voltage</b>                | 3.3v +/- 9%  |



### Technical Specifications

|                     |   |                                |
|---------------------|---|--------------------------------|
| <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)      |
| <b>LED Activity</b> | LED Amber – Radio OFF<br>LED Off – Radio ON |                                |

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

|  |   |
|--|---|
| <b>Bluetooth Specification</b>         | 4.0/4.1/4.2/5.0/5.1 Compliant   |
| <b>Frequency Band</b>                  | 2402 to 2480 MHz  |
| <b>Number of Available Channels</b>    | Legacy: 0~79 (1 MHz/CH)<br>BLE: 0~39 (2 MHz/CH)   |
| <b>Signaling Data Rate</b>             | Legacy: 3 Mbps signaling data rate <sup>1</sup> 2.17 Mbps<br>BLE: 1 Mbps signaling data rate <sup>1</sup> 0.2 Mbps<br><a href="#">1. Actual throughput may vary.</a>  |
|  | Legacy: Synchronous Connection Oriented links up to 3, 64 kbps, voice channels<br>Legacy: Asynchronous Connection Less links 2178.1 kbps/177.1 kbps asymmetric (3-DH5) or 864 kbps symmetric (3-EV5)  |
| <b>Transmit Power</b>                  | The Bluetooth component shall operate as a Class II Bluetooth device with a maximum transmit power of + 9.5 dBm for BR and EDR.   |
| <b>Power Consumption</b>               | Peak (Tx) 330 mW<br>Peak (Rx) 230 mW<br>Selective Suspend 17 mW   |
| <b>Bluetooth Software Supported</b>    | Microsoft Windows Bluetooth Software  |
| <b>Link Topology</b>                   |   |
| <b>Power Management</b>                | Microsoft Windows ACPI, and USB Bus Support   |
| <b>Certifications</b>                  | FCC (47 CFR) Part 15C, Section 15.247 & 15.249  |
| <b>Power Management Certifications</b> | ETS 300 328, ETS 300 826<br>Low Voltage Directive IEC950<br>UL, CSA, and CE Mark  |
| <b>Bluetooth Profiles Supported</b>    | BT4.1-ESR 5/6/7 Compliance<br>LE Link Layer Ping<br>LE Dual Mode<br>LE Link Layer<br>LE Low Duty Cycle Directed Advertising<br>LE L2CAP Connection Oriented Channels<br>Train Nudging & Interlaced Scan<br>BT4.2 ESR08 Compliance<br>LE Secure Connection- Basic/Full<br>LE Privacy 1.2 –Link Layer Privacy<br>LE Privacy 1.2 –Extended Scanner Filter Policies |



### Technical Specifications

LE Data Packet Length Extension  
FAX Profile (FAX)  
Basic Imaging Profile (BIP)2  
Headset Profile (HSP)  
Hands Free Profile (HFP)  
Advanced Audio Distribution Profile (A2DP)

1. Wireless access point and Internet service is required. Availability of public wireless access point is limited.
  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).
  5. Wi-Fi supporting gigabit speeds is achievable when transferring files between two devices connected to the same router. Requires a wireless router, sold separately, that supports 160MHz channels.
  6. 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.
- 





## Technical Specifications

|   |                                    |   |
|---|------------------------------------|---|
| <b>Intel Jefferson Peak2 9560 802.11a/b/g/n/ac (2x2) WiFi® and Bluetooth® 5.0 Combo¹ non-vPro</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 802.11d</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 modules  |
|   | <b>Frequency Band</b>              | <ul style="list-style-type: none"> <li>• 802.11b/g/n<br/>2.402 – 2.482 GHz</li> <li>• 802.11a/n/ac<br/>4.9 – 4.95 GHz (Japan)<br/>5.15 – 5.25 GHz<br/>5.25 – 5.35 GHz<br/>5.47 – 5.725 GHz<br/>5.825 – 5.850 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: MCS 0 ~ MCS 15, (20MHz, and 40MHz)</li> <li>• 802.11ac: MCS0 ~ MCS9, (1SS, and 2SS) (20MHz, 40MHz, 80MHz &amp; 160MHz)</li> </ul>  |
|   | <b>Modulation</b>                  | Direct Sequence Spread Spectrum<br>BPSK, QPSK, CCK, 16-QAM, 64-QAM, 256-QAM   |
|   | <b>Security³</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)<br>Infrastructure (Access Point Required)   |
|   | <b>Roaming</b>                     | IEEE 802.11 compliant roaming between access points   |
|   | <b>Output Power²</b>               | <ul style="list-style-type: none"> <li>• 802.11b: +18.5dBm minimum</li> <li>• 802.11g: +17.5dBm minimum</li> <li>• 802.11a: +18.5dBm minimum</li> <li>• 802.11n HT20(2.4GHz): +15.5dBm minimum</li> <li>• 802.11n HT40(2.4GHz): +14.5dBm minimum</li> <li>• 802.11n HT20(5GHz): +15.5dBm minimum</li> <li>• 802.11n HT40(5GHz): +14.5dBm minimum</li> <li>• 802.11ac VHT80(5GHz): +11.5dBm minimum</li> </ul> |



## Technical Specifications

|   |  |                  |                               |                      |                                |
|---|--|------------------|-------------------------------|----------------------|--------------------------------|
| <b>Power Consumption</b>                | <ul style="list-style-type: none"> <li>• 802.11 ac VHT160(5GHz): +11.5dBm minimum</li> <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/Modern Standby: 10mW</li> <li>• Radio disabled: 8 mW</li> </ul>  |                  |                               |                      |                                |
| <b>Power Management</b>                 | ACPI and PCI Express compliant power management<br>802.11 compliant power saving mode  |                  |                               |                      |                                |
| <b>Receiver Sensitivity<sup>4</sup></b> | <ul style="list-style-type: none"> <li>• 802.11 b, 1Mbps: -93.5dBm maximum</li> <li>• 802.11 b, 11Mbps: -84dBm maximum</li> <li>• 802.11 a/g, 6Mbps: -86dBm maximum</li> <li>• 802.11 a/g, 54Mbps: -72dBm maximum</li> <li>• 802.11 n, MCS07: -67dBm maximum</li> <li>• 802.11 n, MCS15: -64dBm maximum</li> <li>• 802.11 ac, MCS0: -84dBm maximum</li> <li>• 802.11 ac, MCS9: -59dBm maximum</li> </ul> |                  |                               |                      |                                |
| <b>Antenna type</b>                     | High efficiency antenna with spatial diversity, mounted in the display enclosure<br>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 with CNVi Interface   |                  |                               |                      |                                |
| <b>Dimensions</b>                       | <ol style="list-style-type: none"> <li>1. Type 2230: 2.3 x 22.0 x 30.0 mm</li> <li>2. Type 1216: 1.67 x 12.0 x 16.0 mm</li> </ol>  |                  |                               |                      |                                |
| <b>Weight</b>                           | <ol style="list-style-type: none"> <li>1. Type 2230: 2.8 g</li> <li>2. Type 126: 1.3 g</li> </ol>  |                  |                               |                      |                                |
| <b>Operating Voltage</b>                | 3.3v +/- 9%  |                  |                               |                      |                                |
| <b>Temperature</b>                      | <table> <tr> <td><b>Operating</b></td> <td>14° to 158° F (-10° to 70° C)</td> </tr> <tr> <td><b>Non-operating</b></td> <td>-40° to 176° F (-40° to 80° C)</td> </tr> </table>  | <b>Operating</b> | 14° to 158° F (-10° to 70° C) | <b>Non-operating</b> | -40° to 176° F (-40° to 80° C) |
| <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>                         | <table> <tr> <td><b>Operating</b></td> <td>10% to 90% (non-condensing)</td> </tr> <tr> <td><b>Non-operating</b></td> <td>5% to 95% (non-condensing)</td> </tr> </table>  | <b>Operating</b> | 10% to 90% (non-condensing)   | <b>Non-operating</b> | 5% to 95% (non-condensing)     |
| <b>Operating</b>                        | 10% to 90% (non-condensing)  |                  |                               |                      |                                |
| <b>Non-operating</b>                    | 5% to 95% (non-condensing)   |                  |                               |                      |                                |
| <b>Altitude</b>                         | <table> <tr> <td><b>Operating</b></td> <td>0 to 10,000 ft (3,048 m)</td> </tr> <tr> <td><b>Non-operating</b></td> <td>0 to 50,000 ft (15,240 m)</td> </tr> </table>  | <b>Operating</b> | 0 to 10,000 ft (3,048 m)      | <b>Non-operating</b> | 0 to 50,000 ft (15,240 m)      |
| <b>Operating</b>                        | 0 to 10,000 ft (3,048 m)   |                  |                               |                      |                                |
| <b>Non-operating</b>                    | 0 to 50,000 ft (15,240 m)  |                  |                               |                      |                                |
| <b>LED Activity</b>                     | LED Amber – Radio OFF<br>LED Off – Radio ON  |                  |                               |                      |                                |

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

|                                     |   |
|-------------------------------------|---|
| <b>Bluetooth Specification</b>      | 4.0/4.1/4.2/5.0 Compliant                       |
| <b>Frequency Band</b>               | 2402 to 2480 MHz                                |
| <b>Number of Available Channels</b> | Legacy: 0~79 (1 MHz/CH)<br>BLE: 0~39 (2 MHz/CH) |



## Technical Specifications

|  |  |
|--|--|
| <b>Signaling Data Rate</b>             | Legacy: 3 Mbps signaling data rate <sup>1</sup> throughput up to 2.17 Mbps<br>BLE: 1 Mbps signaling data rate <sup>1</sup> throughput up to 0.2 Mbps<br><a href="#">1. Actual throughput may vary.</a>   |
| <b>Transmit Power</b>                  | Legacy: Synchronous Connection Oriented links up to 3, 64 kbps, voice channels<br>Legacy: Asynchronous Connection Less links 2178.1 kbps/177.1 kbps asymmetric (3-DH5) or 864 kbps symmetric (3-EV5)<br>The Bluetooth component shall operate as a Class II Bluetooth device with a maximum transmit power of + 4 dBm for BR and EDR.  |
| <b>Power Consumption</b>               | Peak (Tx) 330 mW<br>Peak (Rx) 230 mW<br>Selective Suspend 17 mW  |
| <b>Bluetooth Software Supported</b>    | Microsoft Windows Bluetooth Software   |
| <b>Link Topology</b>                   |  |
| <b>Power Management</b>                | Microsoft Windows ACPI, and USB Bus Support  |
| <b>Certifications</b>                  | FCC (47 CFR) Part 15C, Section 15.247 & 15.249   |
| <b>Power Management Certifications</b> | ETS 300 328, ETS 300 826<br>Low Voltage Directive IEC950<br>UL, CSA, and CE Mark   |
| <b>Bluetooth Profiles Supported</b>    | BT4.1-ESR 5/6/7 Compliance<br>LE Link Layer Ping<br>LE Dual Mode<br>LE Link Layer<br>LE Low Duty Cycle Directed Advertising<br>LE L2CAP Connection Oriented Channels<br>Train Nudging & Interlaced Scan<br>BT4.2 ESR08 Compliance<br>LE Secure Connection- Basic/Full<br>LE Privacy 1.2 –Link Layer Privacy<br>LE Privacy 1.2 –Extended Scanner Filter Policies<br>LE Data Packet Length Extension<br>FAX Profile (FAX)<br>Basic Imaging Profile (BIP)2<br>Headset Profile (HSP)<br>Hands Free Profile (HFP)<br>Advanced Audio Distribution Profile (A2DP) |

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

2. The FCC has declared as of September 1, 2014 products that utilize passive scanning on channel 12/13 and are capable of transmitting must fully comply with requirements of 15.247 or otherwise disable those channels.

3. Check latest software/driver release for updates on supported security features.



## Technical Specifications

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).

|   |  |  |
|---|--|--|
| <b>Intel® XMM™ 7360 LTE-Advanced CAT9</b> | <b>Technology/Operating bands</b>              | <p>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).</p> <p>TDD LTE: 2600 (Band 38), 1900 (Band 39), 2400 (Band 40), 2500 (Band 41).</p> <p>HSPA+: 2100 (Band 1), 1900 (Band 2), 1700/2100 (Band 4), 850 (Band 5), 900 (Band 8) MHz</p> |
|   | <b>Wireless protocol standards</b>             | <p>3GPP Release 11 LTE Specification CAT.9, DL 60MHz BW throughput up to 450Mbps; UL 20MHz throughput up to 50Mbps</p> <p>WCDMA R99, 3GPP Release 5, 6, 7 and 8 UMTS Specification</p>   |
|   | <b>GPS</b>                                     | <p>Standalone, A-GPS (MS-A, MS-B)</p>  |
|   | <b>GPS bands</b>                               | <p>1575.42 MHz ± 1.023 MHz, GLONASS 1596-1607MHz, Beidou 1561.098 MHz</p>  |
|   | <b>Maximum data rates</b>                      | <p>LTE: 450 Mbps (Download), 50 Mbps (Upload)</p> <p>DC-HSPA+: 42 Mbps (Download), 5.76 Mbps (Upload)</p> <p>HSPA+: 21Mbps (Download), 5.76 Mbps (Upload)</p>  |
|   | <b>Maximum output power</b>                    | <p>LTE: 23 dBm</p> <p>HSPA+: 23.5 dBm</p>  |
|   | <b>Maximum power consumption</b>               | <p>LTE: 1,200 mA (peak); 900 mA (average)</p> <p>HSPA+: 1,100 mA (peak); 800 mA (average)</p>  |
|   | <b>Form Factor</b>                             | <p>M.2, 3042-S3 Key B</p>  |
|   | <b>Weight</b>                                  | <p>5.8 g</p>   |
|   | <b>Dimensions (Length x Width x Thickness)</b> | <p>42 x 30 x 2.3 mm</p>  |

|   |  |  |
|---|--|--|
| <b>NXP NPC300 Near Field Communication Module</b> | <b>Dimensions (L x W x H)</b>            | <p>Module 17 mm by 10 mm by 2.0 mm</p>   |
|   | <b>Chipset</b>                           | <p>NPC300</p>  |
|   | <b>System interface</b>                  | <p>I2C</p>   |
|   | <b>NFC RF standards</b>                  | <p>ISO/IEC 14443 A</p> <p>ISO/IEC 14443 B</p> <p>ISO/IEC 15693</p> <p>ISO/IEC 18092</p> <p>ECMA-340 NFCIP-1 Target and Initiator</p> <p>ECMA-320 NFCIP-2</p> |
|   | <b>NFC Forum Support</b>                 | <p>Tag Type 1, Type 2, Type3 and Type 4, NFCIP-1 and NFCIP-2</p>   |
|   | <b>Reader (PCD-VCD) Mode<sup>1</sup></b> | <p>ISO/IEC 14443 A</p> <p>ISO/IEC 14443 B</p> <p>ISO/IEC 15693</p>   |



## Technical Specifications

|  |  |
|--|--|
|  | MIFARE 1K<br>MIFARE 4K<br>MIFARE DESFire<br>FeliCa<br>Jewel and Topaz cards<br><a href="#">1. With application or UICC support</a> |
| <b>Card Emulation (PICC-VICC) Mode<sup>1</sup></b> | ISO/IEC 14443 A<br>ISO/IEC 14443 B and B'<br>MIFARE<br>FeliCa<br><a href="#">1. With application or UICC support</a>               |
| <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>                       | -25°C to 80°C  |
| <b>Storage temperature</b>                         | -25°C to 125°C   |
| <b>Humidity</b>                                    | 10-90% operating<br>5-95% non-operating  |
| <b>Supply Operating voltage</b>                    | 2.7 to 5.5 Volts   |
| <b>I/O Voltage</b>                                 | 1.8V or 3.3V   |

## Power Consumption

(Booster enable, VBAT= 3.3V, VCC\_BOOST = 5V)

|                                 |   |
|---------------------------------|---|
| <b>Mode</b>                     | Power Consumption, Typical<br>Actual Power Consumption is dependent on NFC antenna and matching circuit and on the particular polling sequence and period configured. |
| <b>Polling</b>                  | 710.93 mW   |
| <b>Detected Test Tag Type 1</b> | 152.09 mW   |
| <b>Detected Test Tag Type 2</b> | 341.26 mW   |
| <b>Detected Test Tag Type 3</b> | 383.76 mW   |
| <b>Detected Test Tag Type 4</b> | 312.26 mW   |
| <b>Antenna</b>                  | Antenna connector, 0.3mm pitch, 7 connector FPC. Antenna matching is external to module.  |

|   |                             |  |
|---|-----------------------------|--|
| <b>Intel i219v 10/100/1000 Integrated NIC</b> | <b>Connector</b>            | RJ-45  |
|   | <b>System Interface</b>     | PCI(Intel proprietary) + SMBus   |
|   | <b>Data rates supported</b> | 10 Mbit/s operation (10BASE-T; IEEE 802.3j; IEEE 802.3 clauses 13-14)<br>100 Mbit/s operation (100BASE-TX; IEEE 802.3u; IEEE 802.3 clauses 21-30)<br>1000 Mbit/s operation (1000BASE-T; IEEE 802.3ab; IEEE 8023 clauses 40)<br>Auto-Negotiation (Automatic Speed Selection)<br>Full Duplex Operation at all Speeds, Half Duplex operation at 10 and 100 Mbit/s |



## Technical Specifications

|                                     |  |
|-------------------------------------|--|
| <b>IEEE Compliance</b>              | IEEE 802.1p QoS (Quality of Service) Support<br>IEEE 802.1q VLAN support<br>IEEE 802.3x Flow Control (IEEE 802.3 clauses 31-32; configurable)<br>IEEE 802.3az EEE (Energy Efficient Ethernet)  |
| <b>Performance</b>                  | TCP/IP/UDP Checksum Offload (configurable)<br>Protocol Offload (ARP & NS)<br>Large send offload and Giant send offload<br>Receiving Side Scaling<br>Jumbo Frame 9K   |
| <b>Power consumption</b>            | Cable Disconnection: 25mW<br>100Mbps Full Run: 450mW<br>1000bp Full Run: 1000mW<br>WoL Enable(S3/S4/S5): 50mW<br>WoL Disable(S3/S4/S5): 25mW   |
| <b>Power Management</b>             | ACPI compliant – multiple power modes<br>Situation-sensitive features reduce power consumption<br>Advanced link down power saving for reducing link down power consumption   |
| <b>Management Interface</b>         | Auto MDI/MDIX Crossover cable detection  |
| <b>IT Manageability</b>             | Wake-on-LAN from standby and hibernation (Magic Packet and Microsoft Wake-Up Frame); Wake-on-LAN from off (Magic Packet only)<br>PXE 2.1 Remote Boot<br>Statistics Gathering (SNMP MIB II, Ethernet-like MIB, Ethernet MIB (802.3x, clause 30))<br>Comprehensive diagnostic and configuration software suite<br>Virtual Cable Doctor for Ethernet cable status |
| <b>Security &amp; Manageability</b> | Intel® vPro™ support with appropriate Intel® chipset components  |

|   |                                   |  |  |
|---|-----------------------------------|--|--|
| <b>RFID Controller Gen 2 (optional)</b> | Dimensions (L x W x H)            | Module 50 mm by 23 mm by 2.89 mm   |  |
|   | Chipset                           | SiM3U156+SiM3U154+AMS3911  |  |
|   | System interface                  | USB 2.0  |  |
|   | System interface (I/O)            | Audio signal output on card read   |  |
|   | NFC RF standards (In reading CSN) | ISO/IEC 14443 A<br>ISO/IEC 14443 B<br>ISO/IEC 15693<br>ISO/IEC 18092<br>ECMA-340 NFCIP-1                     |  |
|   | NFC Forum Support                 | Tag Type 1, Type 2, Type3 and Type 4 in reading CSN  |  |
|   | Reader Mode                       | 13.56MHz:<br>ISO/IEC 14443 A<br>ISO/IEC 14443 B<br>ISO/IEC 15693<br>MIFARE 1K<br>MIFARE 4K<br>MIFARE DESFire |  |
|   |                                   |  |  |
|   |                                   |  |  |
|   |                                   |  |  |



### Technical Specifications

FeliCa  
Topaz cards  
HID iClass ISO  
125kHz:  
HID Prox UID  
AWID UID  
CASI-RUSCO UID  
EM 410x UID  
Indana ASP/ASP+ UID

Frequency 13.56MHz and 125kHz

NFC Modes Supported Reader

Raw RF Data Rates 106, 212 kbps

Operating temperature -30°C to 70°C

Storage temperature -40°C to 80°C

Humidity 10-90% operating  
5-95% non-operating

Supply Operating voltage 4.35 to 5.25 Volts

#### Power Consumption

Mode Power Consumption, Typical

Polling 75mA

Communication 85mA

Antenna 13.56MHz/125kHz combo antenna. Antenna connector, 0.5mm pitch, 16pin connector FPC.





### Technical Specifications

#### POWER

|   |   |  |
|---|---|--|
| <b>AC Adapter 45 Watt nPFC Standard USB Type-C® Straight 1.8m</b> | <b>Dimensions (H x W x D)</b>   | 94.0 x 40.0 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:<br>5V: 81.5%<br>9V: 86.7%<br>12V: 87.41%<br>15V: 87.8%   |
|   |   | <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> 5V/15W<br>9V/27W<br>12V/36W<br>15V/45W   |
|   |   | <b>DC output</b> 5V/9V/12V/15V   |
|   |   | <b>Hold-up time</b> 5 ms at 115 Vac input  |
|   | <b>Connector</b>  | USB Type-C®  |
|   | <b>Environmental Design</b>   | <b>Operating temperature</b> 32°F to 95°F (0° to 35°C)<br><b>Non-operating (storage) temperature</b> -4°F to 185°F (-20° to 85°C)<br><b>Altitude</b> 0 to 16,400 ft (0 to 5,000 m)<br><b>Humidity</b> 20% to 95%<br><b>Storage Humidity</b> 10% to 95% |
| <b>EMI and Safety Certifications</b>                              | CE Mark - full compliance with LVD and EMC directives<br>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.<br>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 26.8 mm   |
|   | <b>Weight</b>     | 200 g +/- 10 g  |
|   | <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> 45 W  |
|   |                   | <b>DC output</b> 19.5 V   |
|   |                   | <b>Hold-up time</b> 5 ms at 115 Vac input                       |
|   |                   | <b>Output current limit</b> <8.0A                               |
|   | <b>Connector</b>  | 4.5mm Barrel Type   |



### Technical Specifications

|                                      |   |                              |
|--------------------------------------|---|------------------------------|
| <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 Certifications</b> | CE Mark - full compliance with LVD and EMC directives<br>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.<br>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 2prong</b> | <b>Dimensions</b>   | 95 x 45 x 26.8 mm                          |   |
|  | <b>Weight</b>   | 200 g +/- 10 g                             |   |
|  | <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>                        | 45 W                                    |
|  |   | <b>DC output</b>                           | 19.5 V                                  |
|  |   | <b>Hold-up time</b>                        | 5 ms at 115 Vac input                   |
|  |   | <b>Output current limit</b>                | <8.0A                                   |
|  | <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 Certifications</b>   | CE Mark - full compliance with LVD and EMC directives<br>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.<br>MTBF - over 200,000 hours at 25°C ambient condition. |  |   |

|   |                   |  |                                      |
|---|-------------------|--|--------------------------------------|
| <b>AC Adapter 65 Watt nPFC Standard USB type C® Straight 1.8m</b> | <b>Dimensions</b> | 90.0 x 51 x 28.5mm                     |                                      |
|   | <b>Weight</b>     | 250 g +/- 10 g                         |                                      |
|   | <b>Input</b>      | <b>Input Efficiency</b>                | 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 |                                      |



### Technical Specifications

|                                      |  |                                  |
|--------------------------------------|--|----------------------------------|
| <b>Output</b>                        | <b>Input frequency range</b>   | 47 ~ 63 Hz                       |
|                                      | <b>Input AC current</b>  | 1.6 A at 90 VAC and maximum load |
|                                      | <b>Output power</b>  | 65 W                             |
|                                      | <b>DC output</b>   | 5V/9V/12V/15V/20V                |
|                                      | <b>Hold-up time</b>  | 5 ms at 115 Vac input            |
|                                      | <b>Output current limit</b>  | 8.0A Max.                        |
| <b>Connector</b>                     | USB Type C®  |                                  |
| <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 Certifications</b> | <p>CE Mark - full compliance with LVD and EMC directives</p> <p>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.</p> <p>MTBF - over 200,000 hours at 25°C ambient condition.</p> |                                  |

|   |  |                               |   |  |
|---|--|-------------------------------|---|--|
| <b>AC Adapter 65 Watt Smart nPFC EM Barrel 4.5mm New EM</b> | <b>Dimensions (H x W x D)</b>              | 102 x 55 x 30mm               |   |  |
|   | <b>Weight</b>                              | 250g +/-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 5,000 m) |   |  |
|   | <b>Humidity</b>                            | 20% to 95%                    |   |  |
|   | <b>Storage Humidity</b>                    | 10% to 95%                    |   |  |



## Technical Specifications

**EMI and Safety  
Certifications**

CE Mark - full compliance with LVD and EMC directives  
 Worldwide safety standards - IEC60950, EN60950, UL60950, Class1,  
 SELV; Agency approvals - C-UL-US, NORDICS, DENAN, EN55022 Class B,  
 FCC Class B, CISPR22 Class B, CCC, NOM-1 NYCE.  
 MTBF - over 200,000 hours at 25°C ambient condition.

**AC Adapter 65 Watt Smart  
 nPFC Standard Barrel  
 4.5mm Right Angle 1.8m**
**Dimensions (H x W x D)  
 Weight  
 Input**

90 x 51 x 28.5mm

230g +/-10%

**Input Efficiency** 88.0 % at 115 Vac and 89.0 % at 230 Vac**Input frequency range** 47 ~ 63 Hz**Input AC current** Max. 1.7 A at 90 Vac**Output****Output power** 65W**DC output** 19.5V**Hold-up time** 5 ms at 115 Vac input**Output current limit** <11.0A**Connector**

4.5mm Barrel Type

**Environmental Design****Operating temperature** 32°F to 95°F (0° to 35°C)**Non-operating (storage) temperature** -4°F to 185°F (-20° to 85°C)**Altitude** 0 to 16,400 ft (0 to 5,000 m)**Humidity** 20% to 95%**Storage Humidity** 10% to 95%**EMI and Safety  
Certifications**

CE Mark - full compliance with LVD and EMC directives  
 Worldwide safety standards - IEC60950, EN60950, UL60950, Class1,  
 SELV; Agency approvals - C-UL-US, NORDICS, DENAN, EN55022 Class B,  
 FCC Class B, CISPR22 Class B, CCC, NOM-1 NYCE.  
 MTBF - over 200,000 hours at 25°C ambient condition.



### Technical Specifications

|   |  |  |
|---|--|--|
| <b>Battery RH 3 Cell WHr 45 Long Life -PL Fast Charge</b> | <b>Dimensions (H x W x L)</b>            | 6.2 x 68.7 x 249.6mm                   |
|   | <b>Weight</b>                            | 190g                                   |
|   | <b>Cells/Type</b>                        | 3cell Lithium-Ion Polymer cell/ 545974 |
|   | <b>Voltage</b>                           | 11.4 V                                 |
|   | <b>Amp-hour capacity</b>                 | 3.950Ah                                |
|   | <b>Watt-hour capacity</b>                | 45 Wh                                  |
|   | <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>Optional Travel Battery Available</b> | No                                     |
|   | <b>Warranty</b>                          | Based on system offering               |

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### Technical Specifications

#### ENVIRONMENTAL DATA

##### Sustainable Impact Specifications

- Bulk packaging available
- Low halogen<sup>1</sup>
- Ocean-Bound Plastic in speaker enclosure<sup>2</sup>
- Outside Box and corrugated cushions are 100% sustainably sourced and recyclable<sup>3</sup>
- 10% post-consumer recycled plastic<sup>4</sup>

1. External power supplies, WWAN modules, power cords, cables and peripherals excluded.

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.

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#### Country of Origin

China

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

| Type                | Description   | Part Number |
|---------------------|---|-------------|
| <b>Cases</b>        | HP Business Backpack (up to 17.3")                    | 2SC67AA     |
|                     | HP Business Slim Top Load (up to 15.6")               | 2SC65AA     |
|                     | HP Prelude Pro Recycle Backpack (Montrose)            | 1X644AA     |
|                     | HP Prelude Pro Recycle Top Load (Midtown)             | 1X645AA     |
|                     | HP Recycled Top Load                                  | 5KN29AA     |
|                     | HP Recycled Backpack                                  | 5KN28AA     |
| <b>Docking</b>      | HP USB-C Mini Dock                                    | 1PM64AA     |
|                     | HP Thunderbolt Dock 120W G2                           | 2UK37AA     |
|                     | HP TB Dock G2 w/ Combo Cable                          | 3TR87AA     |
|                     | HP TB Dock 120W G2 w/Audio                            | 3YE87AA     |
|                     | HP TB Dock 120W G2 Cable                              | 3XB94AA     |
|                     | HP TB Dock G2 Combo Cable                             | 3XB96AA     |
|                     | HP TB Dock G2 Audio Module                            | 3AQ21AA     |
|                     | HP USB-C/A Universal Dock G2                          | 5TW13AA     |
|                     | HP USB-C Dock G5                                      | 5TW10AA     |
| <b>Input/Output</b> | HP USB Essential Keyboard and Mouse                   | H6L29AA     |
|                     | HP Wired Desktop 320MK Mouse & Keyboard               | 9SR36AA     |
|                     | HP Bluetooth Travel Mouse                             | 6SP30AA     |
|                     | HP Comfort Grip Wireless Mouse                        | H2L63AA     |
|                     | HP Wired Desktop 320M Mouse                           | 9VA80AA     |
|                     | HP USB Travel Mouse                                   | G1K28AA     |
|                     | HP Elite USB-C Hub                                    | 4WX89AA     |
|                     | HP USB-C Travel Hub G2                                | 7PJ38AA     |
|                     | HP USB-C to RJ45 Adapter                              | V7W66AA     |
|                     | HP USB-C to USB 3.0 Adapter                           | N2Z63AA     |
|                     | HP USB-C to HDMI 2.0 Adapter                          | 1WC36AA     |
| <b>Power</b>        | HP 45W Smart AC Adapter 4.5mm                         | H6Y88AA     |
|                     | 45W Smart Power Adapter 2 prong -4.5mm (Japan only)   | L6F60AA     |
|                     | 65W Smart Power Adapter (w/ 4.5mm to 7.5mm DC dongle) | H6Y89AA     |
|                     | HP 65W Slim AC Adapter                                | H6Y82AA     |
|                     | HP 65W USB-C Slim Power Adapter                       | 3PN48AA     |
|                     | HP 45W LC USB-C Power Adapter                         | 1MZ01AA     |
|                     | HP 65W USB-C LC Power Adapter                         | TBD         |
|                     | HP Power Bank   | N9F71AA     |
|                     | HP USB-C Notebook Power Bank                          | 3TB55AA     |



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

|                 |                               |         |
|-----------------|-------------------------------|---------|
| <b>Storage</b>  | HP External USB Optical Drive | F2B56AA |
| <b>Security</b> | HP Sure Key Cable Lock        | 6UW42AA |
|                 | HP Nano Keyed Cable Lock      | 1AJ39AA |





### Summary of Changes

| <b>Date of change:</b> | <b>Version History:</b> |        | <b>Description of change:</b>                      |
|------------------------|-------------------------|--------|--|
| January 14, 2021       | V1 to V2                | Update | Processor section                                  |
| January 21, 2021       | V2 to V3                | Added  | WPA3 certification in Security, Networking section |
| February 2, 2021       | V3 to V4                | Update | UEFI Version                                       |
| February 3, 2021       | V4 to V5                | Update | Software and Security section                      |
| February 9, 2021       | V5 to V6                | Added  | Environmental Data                                 |
| February 24, 2021      | V6 to V7                | Update | USB Ports  |
|                        | V7 to V8                |        |  |
|                        |                         |        |  |

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