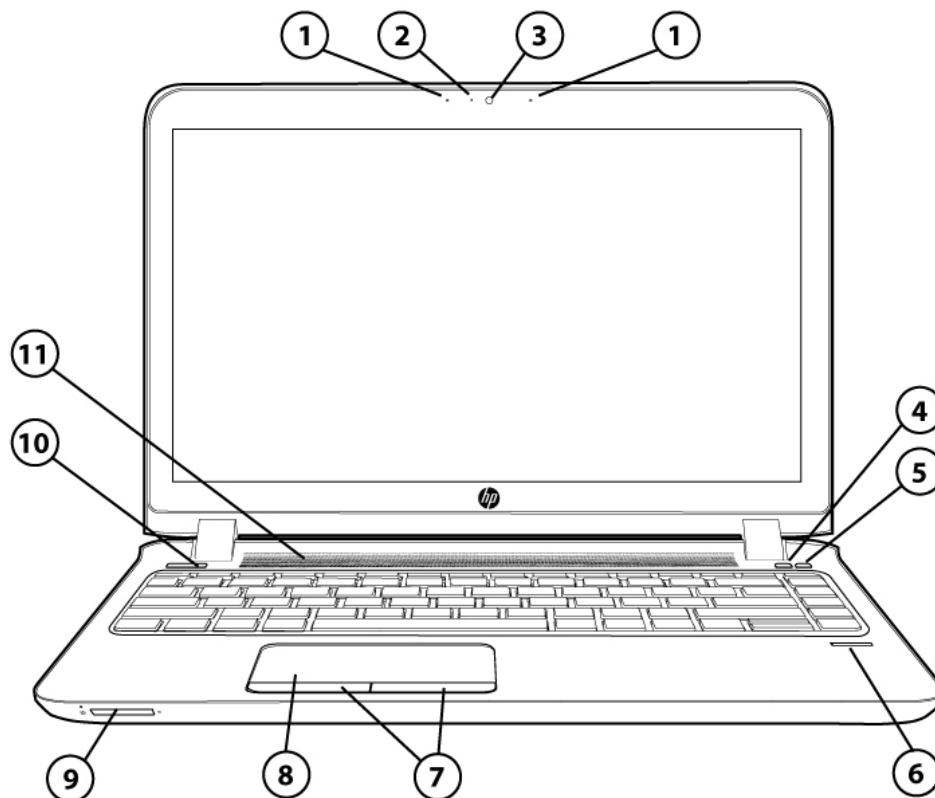


# QuickSpecs

## Overview

### vHP ProBook 455 G3 Notebook PC



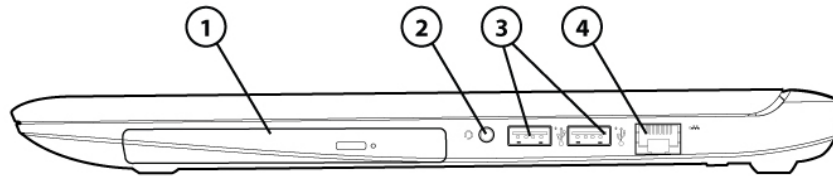
#### Front

- |                           |                          |
|---------------------------|--------------------------|
| 1. Microphones (2)        | 7. Touchpad pick buttons |
| 2. Webcam light           | 8. Touchpad              |
| 3. Webcam                 | 9. SD Card reader        |
| 4. Wireless on/off button | 10. Power button         |
| 5. Speaker mute button    | 11. Speaker array        |
| 6. Fingerprint reader     |                          |



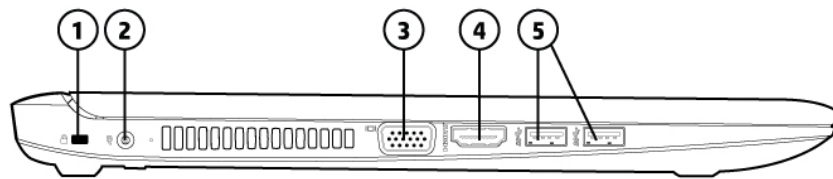
# QuickSpecs

## Overview



### Right

- |                                    |                         |
|------------------------------------|-------------------------|
| 1. Optical drive                   | 3. USB 2.0 ports (2)    |
| 2. Headphone/Microphone combo jack | 4. RJ-45 /Ethernet port |



### Left

- |                              |                      |
|------------------------------|----------------------|
| 1. Security lock slot        | 4. HDMI port         |
| 2. Power connector           | 5. USB 3.0 ports (2) |
| 3. External VGA monitor port |                      |



# QuickSpecs

## Overview

### AT A GLANCE

- Windows 10 versions, Windows 8.1 versions, Windows 7 versions, or FreeDOS 2.0
- Durable multi-layer soft touch painted LCD cover and brushed aluminum keyboard deck that keeps system looking good longer
- Choose from AMD APUs (Accelerated Processing Unit) with Radeon™ Graphics
- Models available with switchable discrete graphics.
- Weight starting at 4.74 lbs (2.15 kg)
- 15.6" diagonal HD Anti-glare LED-backlit (1366 x 768) display
- Storage options up to 1 TB Hard Drive
- Memory options up to 16 GB
- Full size HP Premium Keyboard, spill-resistant keyboard with a thin layer of Mylar film to prevent minor spills; full separate numeric keypad
- Larger Touchpad with gestures support, on/off button with LED indicator
- HDMI port for connecting to high-resolution displays on select models
- HP Webcam (front-facing) with integrated speakers
- Enhanced security features including HP TouchPoint Manager, HP Security Manager and optional HP Fingerprint Reader and TPM
- HP 3D DriveGuard helps protect critical information while you're on the move.
- DTS Studio Sound™ optimized for high fidelity audio
- Passed MIL-STD testing<sup>1</sup>
- Battery life up to 9 hours and 15 minutes
- Supports a broad range of wireless options:
  - Realtek 802.11 b/g/n (1x1)
  - Realtek 802.11 b/g/n (1x1) + Bluetooth® Combo
  - Broadcom 802.11 b/g/n (1x1) + Bluetooth® Combo
  - Broadcom 802.11 a/b/g/n (2x2) + Bluetooth® Combo

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

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



### Features

#### PRODUCT NAME

HP ProBook 455 G3 Notebook PC

#### OPERATING SYSTEM

##### Preinstalled

Windows 10 Pro 64<sup>1</sup>  
 Windows 10 Home 64<sup>1</sup>  
 Windows 8.1 Pro 64<sup>1</sup>  
 Windows 8.1 64<sup>1</sup>  
 Windows 7 Professional 64 (available through downgrade rights from Windows 10 Pro)<sup>2</sup>  
 Windows 7 Professional 32 (available through downgrade rights from Windows 10 Pro)<sup>2,4</sup>  
 Windows 7 Professional 64 (available through downgrade rights from Windows 8.1 Pro)<sup>3</sup>  
 Windows 7 Professional 32 (available through downgrade rights from Windows 8.1 Pro)<sup>3,4</sup>  
 Windows 7 Professional 64<sup>1</sup>  
 Windows 7 Professional 32<sup>1</sup>  
 FreeDOS 2.0

##### Web only supported

Windows 7 Professional 32<sup>1</sup>  
 Windows 10 Enterprise 64<sup>1</sup>  
 Windows 8.1 Enterprise 64<sup>1</sup>  
 Windows 7 Enterprise 64<sup>1</sup>  
 Windows 7 Enterprise 32<sup>1</sup>

1. Not all features are available in all editions or versions of Windows 10. Systems may require upgraded and/or separately purchased hardware, drivers, software or BIOS update to take full advantage of Windows 10 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.microsoft.com>
2. This system is preinstalled with Windows 7 Professional software and also comes with a license and media for Windows 10 Professional software. You may only use one version of the Windows software at a time. Switching between versions will require you to uninstall one version and install the other version. You must back up all data (files, photos, etc.) before uninstalling and installing operating systems to avoid loss of your data.
3. This system is preinstalled with Windows 7 Pro software and also comes with a license and media for Windows 8.1 Pro software. You may only use one version of the Windows software at a time. Switching between versions will require you to uninstall one version and install the other version. You must back up all data (files, photos, etc.) before uninstalling and installing operating systems to avoid loss of your data
4. Japan only.

#### APUs (ACCELERATED PROCESSING UNIT)

AMD A10-8700P APU with Radeon™ R6 Graphics, Quad Cores, 3.2 GHz/1.8 GHz, 2 MB L2 Cache<sup>1</sup>  
 AMD A8-7410 APU with Radeon™ R5 Graphics, Quad Cores, 2.5 GHz/2.2 GHz, 2 MB L2 Cache<sup>2</sup>  
 AMD A4-7210 APU with Radeon™ R3 Graphics, Quad Cores, 2.2 GHz/1.8 GHz, 2 MB L2 Cache<sup>3</sup>

1. This system requires a separately purchased 64-bit operating system and 64-bit software products to take advantage of the 64-bit processing capabilities of AMD technology. Multi-core processing with AMD technology is



### Features

designed to improve performance of this system. Given the wide range of SW applications available, performance will vary. AMD's numbering is not a measurement of clock speed.

**NOTE:** Processor speed denotes maximum performance mode; processors will run at lower speeds in battery optimization mode.

### GRAPHICS

#### Integrated UMA Graphics

AMD A10-8700P APU with Radeon™ R6 Graphics

AMD A8-7410 APU with Radeon™ R5 Graphics

AMD A4-7210 APU with Radeon™ R3 Graphics

#### AMD Switchable Discrete Graphics

AMD A8-7410 APU with Radeon™ R7 M340 Graphics, with 2 GB dedicated DDR3 video memory

AMD A4-7210 APU with Radeon™ R7 M340 Graphics, with 2 GB dedicated DDR3 video memory

#### AMD Dual Graphics

AMD A10-8700P APU with Radeon™ R8 M350DX Graphics, with 2 GB dedicated DDR3 video memory

### DISPLAY

#### Internal

15.6" diagonal HD<sup>1</sup> Anti-glare LED-backlit (1366 x 768)

#### External

Up to 32-bit per pixel color depth

#### VGA<sup>2</sup>

Port supports resolutions up to 2048 x 1536 @ 60 Hz

#### HDMI<sup>2</sup>

v1.4 (HDMI cable sold separately.)

1. HD content required to view HD images.
2. Available on A4 and A8 APUs only. Supports either VGA or HDMI. Cannot support both VGA and HDMI simultaneously.

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

### STORAGE AND DRIVES

#### Primary Storage Bay

##### Hard Drives

SATA, 7mm/9.5mm, 2.5" Hard Drives

500 GB - 5400 RPM Hard Drive

500 GB - 7200 RPM Hard Drive

1 TB - 5400 RPM Hard Drive

#### HP 3D DriveGuard (Windows only)

The hard drive is mounted directly to the notebook frame, reducing the transmission of shock to the hard drive



### Features

**NOTE:** For hard drives, GB = 1 billion bytes. Actual formatted capacity is less.  
Up to 30 GB (for Windows 10 and Windows 8.1) of system disk is reserved for the system recovery software.

### MEMORY

#### Standard

Two SODIMM slots  
Both slots are customer accessible / upgradeable  
Supports Single Channel Memory  
DDR3L-1600 (Transfer rates up to 1600 MT/s)

2048 MB Total System Memory (2048 MB x 1)  
4096 MB Total System Memory (4096 MB x 1)  
6144 MB Total System Memory (4096 MB + 2048 MB) (Single Channel)  
8192 MB Total System Memory (4096 MB x 2) (Single Channel)  
8192 MB Total System Memory (8192 MB x 1)  
12288 MB Total System Memory (8192 MB + 4096 MB) (Single Channel)  
16384 MB Total System Memory (8192 MB x 2) (Single Channel)

#### Maximum

16384 MB in slots 1 and 2

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

### NETWORKING/COMMUNICATIONS

#### WLAN

Realtek 802.11 b/g/n (1x1)<sup>1</sup>  
Realtek 802.11 b/g/n (1x1) + Bluetooth® Combo<sup>1,2</sup>  
Broadcom 802.11 b/g/n (1x1) + Bluetooth® Combo<sup>1,2</sup>  
Broadcom 802.11 a/b/g/n (2x2) + Bluetooth® Combo<sup>1,2</sup>

1. Wireless access point and Internet service required and sold separately. Availability of public wireless access points limited.
2. Sold separately or as an optional feature.
3. Bluetooth® 4.0 is only supported via Combo card.

#### Communications

Integrated Ethernet 10/100/1000 (Gigabit) NIC

### AUDIO/MULTIMEDIA

#### Audio

HD Audio with DTS Studio Sound™  
Integrated microphone (Mono on non-webcam models only)  
Integrated microphone (Dual Array on webcam models only)  
2 Stereo Speakers  
Function keys for microphone mute, volume up, volume down



### Features

Stereo Audio-out (headphone)/Audio-in(microphone)

#### **Optional Webcam<sup>1,2</sup>**

HP Camera (720p HD)<sup>3</sup>

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

### KEYBOARDS/POINTING DEVICES

#### **HP Premium Keyboard**

The HP spill-resistant keyboard is designed using a thin layer of Mylar film under the keyboard. The 101/102-key compatible keyboard features a full-pitch key layout with desktop keyboard features, such as editing keys, both left and right control and alt keys, and function keys. US and International key layouts are available. Includes a separate numeric keypad. Backlit keyboard available as an option.

#### **Buttons and Function Keys**

Separate launch buttons provide easy access to wireless on/off and speaker mute. Function keys provide control of features including: standby mode, display brightness, external display, microphone mute, volume down, volume up, and backlight toggle for backlit keyboard (select models only).

#### **Function Keys**

ESC: system information

F1 - Sleep

F2 - Blank

F3 - Backlight Toggle (for backlit keyboard) or Blank

F4 - Display Switching

F5 - brightness down

F6 - brightness up

F7 - Blank

F8 - Volume Down

F9 - Volume Up

F10 - Mic Mute

F11 - Blank

F12 - Blank

#### **Hidden Functions**

o Fn+R --> Break

o Fn+S --> Sys Rq

o Fn+C --> Scroll Lock

#### **TouchPad**

On/off button (on board)

Taps enabled as default

#### **Gestures**

##### **Enabled by default**

2 Finger Scrolling

2 Finger Zoom (Pinch)

OSD (enable/disable)



### Features

Win 8 2 Finger tap = right click  
Win 8 Edge Swipes

#### **Disabled by default**

3 Finger Flick  
2 Finger Rotate  
Momentum Motion  
1 Finger Vertical Scroll

### SOFTWARE AND SECURITY

#### **Preinstalled Software**

##### **BIOS**

HP BIOSphere<sup>1</sup>  
HP DriveLock | HP Automatic DriveLock  
HP BIOS Protection<sup>2</sup>  
Master Boot Record Security  
Power On Authentication  
Pre-Boot Security  
Secure Erase<sup>3</sup>  
Hybrid Boot (Windows 8.1 & later)  
Measure Boot (Windows 8.1 & later)  
Secure Boot (Windows 8.1 & later)  
Absolute Persistence Module<sup>4</sup>

##### **Multi Media**

Cyberlink Power DVD, BD  
Cyberlink Power2Go (Secure Burn)  
Cyberlink YouCam BE (Windows 7 only)

##### **Communication**

HP GPS and Location (Windows 7 only)<sup>5</sup>  
HP Connection Manager with support for HP Mobile Connect (Windows 7 only)<sup>6</sup>  
HP Mobile Connect (Windows 8.1 & later)<sup>6</sup>  
Native Miracast Support<sup>8</sup>

##### **HP Value Add Software**

HP 3D DriveGuard  
HP ePrint Driver<sup>9</sup>  
HP Hotkey  
HP Recovery Manager  
HP Recovery Disc Creator  
HP Unified Recovery Manager (Windows 8.1 and 10 only)



### Features

HP Registration App (Windows 8.1 & later)  
HP Support Assistant  
HP Noise Reduction Software  
HP Pixel Sharp

#### 3<sup>rd</sup> Party

Foxit PhantomPDF Express for HP

#### Microsoft Products

Buy Office  
Bing Search  
Skype<sup>10</sup>

#### Manageability

HP Driver Packs<sup>11</sup>  
HP SoftPaq Download Manager (SDM)  
HP System Software Manager (SSM)<sup>11</sup>  
HP BIOS Config Utility (BCU)<sup>11</sup>  
HP Client Catalog<sup>11</sup>  
HP CIK for Microsoft SCCM<sup>11</sup>  
LANDESK Management<sup>12</sup>

For more information on HP Client Management Solutions refer to: <http://www.hp.com/go/clientmanagement>.

#### Client Security Software

Absolute Persistence Module  
HP Drive Encryption<sup>13</sup>  
HP Security Manager  
Microsoft Security Essentials<sup>14</sup>  
Microsoft Defender

#### Security

Pre-boot Authentication  
Security lock slot (Lock sold separately.)  
Optional<sup>15</sup> Fingerprint Reader  
TPM 1.2/ 2.0<sup>16</sup>

**NOTE:** The Absolute Persistence agent is shipped turned off, and must be activated by customers when they purchase a subscription. Subscriptions can be purchased for terms ranging multiple years. Service is limited, check with Absolute for availability outside the U.S.

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

1. Available only on business PCs with HP BIOS.
2. May require a manual recovery step if all copies of BIOS are compromised or deleted.



### Features

3. For the methods outlined in the National Institute of Standards and Technology Special Publication 800-88.
4. Absolute agent is shipped turned off, and will be activated when customers activate a purchased subscription. Subscriptions can be purchased for terms ranging multiple years. Service is limited, check with Absolute for availability outside the U.S. The Absolute Recovery Guarantee is a limited warranty. Certain conditions apply. For full details visit: <http://www.absolute.com/company/legal/agreements/computrace-agreement>. Data Delete is an optional service provided by Absolute Software. If utilized, the Recovery Guarantee is null and void. In order to use the Data Delete service, customers must first sign a Pre-Authorization Agreement and either obtain a PIN or purchase one or more RSA SecurID tokens from Absolute Software.
5. GPS access requires an unobstructed path to multiple satellites. Performance may be affected if/when used inside of buildings, bridges or heavily congested metropolitan areas. Requires separately purchased GPS navigation software available from multiple GPS applications.
- 7 HP Mobile Connect is only available on preconfigured devices with WWAN. For geographic availability refer to <http://www.hp.com/go/mobileconnect>
8. Miracast is a wireless technology your PC can use to project your screen to TVs, projectors, and streaming media players that also support Miracast. You can use Miracast to share what you're doing on your PC and present a slide show. For more information: <http://windows.microsoft.com/en-us/windows-8/project-wireless-screen-miracast>
9. Requires an Internet connection to HP web-enabled printer and HP ePrint account registration (for a list of eligible printers, supported documents and image types and other HP ePrint details, see <http://www.hp.com/go/eprintcenter>). Requires optional broadband module. Broadband use requires separately purchased service contract. Check with service provider for coverage and availability in your area. Separately purchased data plans or usage fees may apply. Print times and connection speeds may vary.
10. Skype is not offered in China.
11. Not preinstalled, however available on manageability website.
12. Subscription required.
13. Data is protected prior to Drive Encryption login. Turning the PC off or into hibernate logs out of Drive Encryption and prevents data access.
14. Opt in and internet connection required for updates.
15. Sold separately or as an optional feature.
16. This product ships with TPM 1.2 with option to upgrade to TPM 2.0. Upgrade utility is expected to be available by the second half of 2016 via HP Customer Support.

### POWER

#### Power Supply

##### Models with discrete graphics

HP 65W Smart AC Adapter

##### Models with integrated graphics

HP 45W Smart AC Adapter

HP 45W Smart AC Adapter (two prong) (Japan only) (1.0 m power cord only)

Power cord included is 1.8 m (+/- 0.1 m) or 1.0 m (+/- 0.1 m).

Total length including external AC adapter is 12 feet (3.66 meter).

#### Batteries

HP 4 cell (44 WHr) Lithium-Ion Battery

Optional HP 6 cell (55 WHr) Long Life Lithium-Ion Battery<sup>1</sup>



### Features

1. Sold separately or as an optional feature.

#### Battery Life

| Memory/OS        | Battery         | UMA Graphics                     | Discrete Graphics                |
|------------------|-----------------|----------------------------------|----------------------------------|
| DDR3/Windows 8.1 | 4 cell (44 Whr) | Up to 7 hrs 15 mins <sup>1</sup> | Up to 7 hrs 30 mins <sup>1</sup> |
| DDR3/Windows 8.1 | 6 cell (55 Whr) | Up to 9 hrs 15 mins <sup>1</sup> | Up to 9 hrs 15 mins <sup>1</sup> |

1. Windows 8.1 MM14 battery life will vary depending on various factors including product model, configuration, loaded applications, features, use, wireless functionality, and power management settings. The maximum capacity of the battery will naturally decrease with time and usage. See [www.bapco.com](http://www.bapco.com) for additional details.

#### System Standby Time

TBD

### WEIGHTS & DIMENSIONS

#### Weight<sup>1</sup>

Starting at 4.74 lbs (2.15 kg)  
(No-ODD, 4 (44 Whr) cell Battery)

#### Other Weights<sup>1</sup>

|               |                        |
|---------------|------------------------|
| 4.98lb/2.26kg | ODD, 4 cell Battery    |
| 5.00lb/2.27kg | No-ODD, 6 cell Battery |
| 5.25lb/2.38kg | ODD, 6 cell Battery    |

1. Weight varies by configuration and components.

#### Dimensions (w x d x h)

14.88 x 10.41 x 0.94 in (Front) – 0.98 (at rear)  
37.80 x 26.43 x 2.38 cm (Front) – 2.48 (at rear)

**NOTE:** Height varies depending upon where on the notebook the measurement is made.

### PORTS/SLOTS

#### Ports

2 USB 3.0 Ports  
2 USB 2.0 Ports  
1 HDMI  
1 VGA  
1 RJ-45 /Ethernet  
1 Headphone/Microphone Combo Jack  
1 Power Adapter connector

**NOTE:** All cables are sold separately.



### Features

**Media Reader Slot**

Support SD/SDHC/SDXC

Push-Push Insertion/Removal

### SERVICE AND SUPPORT

Services offers limited 3-year, 1-year and 90-day warranty options depending on country.

1-year limited warranty on primary battery. On-site service and optional extended service contracts are also available.

Optional<sup>1</sup> HP Services<sup>2</sup> are extended service contracts which go beyond your standard limited warranties. For more details visit: <http://www.hp.com/go/lookuptool>.

1. Sold separately or as an optional feature.
2. Service levels and response times for HP Care Packs may vary depending on your geographic location. Service starts on date of hardware purchase. Restrictions and limitations apply. 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. 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>.



### Technical Specifications

#### SYSTEM UNIT

|                                                  |                                         |                                                                                                  |
|--------------------------------------------------|-----------------------------------------|--------------------------------------------------------------------------------------------------|
| <b>Stand-Alone Power Requirements</b> (AC Power) | <b>Nominal Operating Voltage</b>        | 19.5V                                                                                            |
|                                                  | <b>Average Operating Power</b>          | 21W                                                                                              |
|                                                  | <b>Max Operating Power</b>              | Discrete < 65W<br>UMA < 45W                                                                      |
| <b>Temperature</b>                               | <b>Operating</b>                        | 32° to 95° F (0° to 35° C) (not writing optical)<br>41° to 95° F (5° to 35° C) (writing optical) |
|                                                  | <b>Non-operating</b>                    | -4° to 140° F (-20° to 60° C)                                                                    |
| <b>Relative Humidity</b>                         | <b>Operating</b>                        | 10% to 90%, non-condensing                                                                       |
|                                                  | <b>Non-operating</b>                    | 5% to 95%, 101.6° F (38.7° C) maximum wet bulb temperature                                       |
| <b>Shock</b>                                     | <b>Operating</b>                        | 40 G, 2 ms, half-sine                                                                            |
|                                                  | <b>Non-operating</b>                    | 200 G, 2 ms, half-sine                                                                           |
| <b>Random Vibration</b>                          | <b>Operating</b>                        | 0.75 grms                                                                                        |
|                                                  | <b>Non-operating</b>                    | 1.50 grms                                                                                        |
| <b>Altitude</b> (unpressurized)                  | <b>Operating</b>                        | -50 to 10,000 ft (-15.24 to 3,048 m)                                                             |
|                                                  | <b>Non-operating</b>                    | -50 to 40,000 ft (-15.24 to 12,192 m)                                                            |
| <b>Planned Industry Standard</b>                 | <b>UL</b>                               | Yes                                                                                              |
| <b>Certifications</b>                            | <b>CSA</b>                              | Yes                                                                                              |
|                                                  | <b>FCC Compliance</b>                   | Yes                                                                                              |
|                                                  | <b>ENERGY STAR®</b>                     | Select models*                                                                                   |
|                                                  | <b>EPEAT®</b>                           | Registered Gold in United States**                                                               |
|                                                  | <b>ICES</b>                             | Yes                                                                                              |
|                                                  | <b>Australia / NZ A-Tick Compliance</b> | Yes                                                                                              |
|                                                  | <b>CCC</b>                              | Yes                                                                                              |
|                                                  | <b>Japan VCCI Compliance</b>            | Yes                                                                                              |



### Technical Specifications

|                                        |     |
|----------------------------------------|-----|
| <b>KC</b>                              | Yes |
| <b>BSMI</b>                            | Yes |
| <b>CE Marking Compliance</b>           | Yes |
| <b>BNCI or BELUS</b>                   | Yes |
| <b>CIT</b>                             | Yes |
| <b>GOST</b>                            | Yes |
| <b>Saudi Arabian Compliance (ICCP)</b> | Yes |
| <b>SABS</b>                            | Yes |
| <b>UKRSERTCOMPUTER</b>                 | Yes |

\* Configurations of the HP ProBook 455 G3 that are ENERGY STAR qualified are identified as HP ProBook 455 G3 ENERGY STAR on HP websites and on <http://www.energystar.gov>.

\*\* EPEAT registration varies by country. See [www.epeat.net](http://www.epeat.net) for registration status by country. EPEAT status listed above applies to U.S.

For accessibility information on HP products, please visit: <http://www.hp.com/accessibility>.

### DISPLAYS

|                                                          |                           |                                                                                                                                         |            |
|----------------------------------------------------------|---------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|------------|
| <b>15.6-inch diagonal LED HD (1366 x 768) anti-glare</b> | <b>Dimensions (W x H)</b> | 14.17 x 8.83 in (36.0 x 22.43 cm)                                                                                                       |            |
|                                                          | <b>Weight</b>             | 500g max.                                                                                                                               |            |
|                                                          | <b>Diagonal Size</b>      | 15.6 in (39.6cm)                                                                                                                        |            |
|                                                          | <b>Surface Treatment</b>  | Anti-glare                                                                                                                              |            |
|                                                          | <b>Contrast Ratio</b>     | 400:1 (min)                                                                                                                             |            |
|                                                          | <b>Refresh Rate</b>       | 60 Hz                                                                                                                                   |            |
|                                                          | <b>Brightness</b>         | 200 nit (typical)                                                                                                                       |            |
|                                                          | <b>Pixel Resolution</b>   | <b>Pitch</b>                                                                                                                            | 0.252 mm   |
|                                                          |                           | <b>Format</b>                                                                                                                           | 1366 x 768 |
|                                                          |                           | <b>Configuration</b>                                                                                                                    | RGB Stripe |
|                                                          | <b>Backlight</b>          | LED                                                                                                                                     |            |
|                                                          | <b>PPI</b>                | 106 ppi                                                                                                                                 |            |
|                                                          | <b>Viewing Angle</b>      | ±30° Horizontal, ±10° Vertical (minimum)<br>30/30/20/10 (Left/Right/Down/Up) (minimum) or<br>45/45/35/25 (Left/Right/Down/Up) (typical) |            |



### Technical Specifications

#### STORAGE AND DRIVES

|                                         |                                                         |                                                          |
|-----------------------------------------|---------------------------------------------------------|----------------------------------------------------------|
| <b>500 GB* 5400 rpm SATA Hard Drive</b> | <b>Drive Weight</b>                                     | 0.22 lb (101 g)                                          |
|                                         | <b>Capacity</b>                                         | 500 GB                                                   |
|                                         | <b>Height</b>                                           | 0.276 in (7 mm)                                          |
|                                         | <b>Width</b>                                            | 2.75 in (70 mm)                                          |
|                                         | <b>Interface</b>                                        | ATA-8, SATA 2.6, 3.0 Gb/s, NCQ                           |
|                                         | <b>Transfer Rate</b>                                    | <b>Synchronous</b> (maximum) 300 MB/s (Drive Capability) |
|                                         | <b>Seek Time</b><br>(typical reads, including settling) | <b>Single Track</b> 3 ms                                 |
|                                         |                                                         | <b>Average</b> 13 ms                                     |
|                                         |                                                         | <b>Maximum</b> 24 ms                                     |
|                                         | <b>Rotational Speed</b>                                 | 5400 rpm                                                 |
|                                         | <b>Logical Blocks</b>                                   | 976,773,168                                              |
|                                         | <b>Operating Temperature</b>                            | 32° to 140° F (0° to 60° C) [case temp]                  |
|                                         | <b>Features</b>                                         | ATA Security                                             |

|                                         |                                                         |                                                          |
|-----------------------------------------|---------------------------------------------------------|----------------------------------------------------------|
| <b>500 GB* 7200 rpm SATA Hard Drive</b> | <b>Drive Weight</b>                                     | 0.25 lbs (115g)                                          |
|                                         | <b>Capacity</b>                                         | 500 GB                                                   |
|                                         | <b>Height</b>                                           | 0.276 in (7 mm)                                          |
|                                         | <b>Width</b>                                            | 2.75 in (70 mm)                                          |
|                                         | <b>Interface</b>                                        | ATA-8, SATA 2.6, 3.0 Gb/s, NCQ                           |
|                                         | <b>Transfer Rate</b>                                    | <b>Synchronous</b> (maximum) 300 MB/s (Drive Capability) |
|                                         | <b>Seek Time</b><br>(typical reads, including settling) | <b>Single Track</b> 1.5 ms                               |
|                                         |                                                         | <b>Average</b> 11 ms                                     |
|                                         |                                                         | <b>Maximum</b> 22 ms                                     |
|                                         | <b>Rotational Speed</b>                                 | 7200 rpm                                                 |
|                                         | <b>Logical Blocks</b>                                   | 976,773,168                                              |
|                                         | <b>Operating Temperature</b>                            | 32° to 140° F (0° to 60° C) [case temp]                  |
|                                         | <b>Features</b>                                         | ATA Security                                             |

|                                       |                                                         |                                                          |
|---------------------------------------|---------------------------------------------------------|----------------------------------------------------------|
| <b>1 TB* 5400 rpm SATA Hard Drive</b> | <b>Drive Weight</b>                                     | 0.254 lb (115 g)                                         |
|                                       | <b>Capacity</b>                                         | 1 TB                                                     |
|                                       | <b>Height</b>                                           | 0.37 in (9.5 mm)                                         |
|                                       | <b>Width</b>                                            | 2.75 in (70 mm)                                          |
|                                       | <b>Interface</b>                                        | ATA-8, SATA 2.6, 3.0 Gb/s, NCQ                           |
|                                       | <b>Transfer Rate</b>                                    | <b>Synchronous</b> (maximum) 300 MB/s (Drive Capability) |
|                                       | <b>Seek Time</b><br>(typical reads, including settling) | <b>Single Track</b> 3 ms                                 |
|                                       |                                                         | <b>Average</b> 13 ms                                     |
|                                       |                                                         | <b>Maximum</b> 24 ms                                     |
|                                       | <b>Rotational Speed</b>                                 | 5400 rpm                                                 |
|                                       | <b>Logical Blocks</b>                                   | 1,953,525,168                                            |



### Technical Specifications

|                              |                                         |
|------------------------------|-----------------------------------------|
| <b>Operating Temperature</b> | 32° to 140° F (0° to 60° C) [case temp] |
| <b>Features</b>              | ATA Security                            |

\*For hard drives, GB = 1 billion bytes. Actual formatted capacity is less.

Up to 30 GB (for Windows 10 and Windows 8.1) of system disk is reserved for the system recovery software.

### NETWORKING/COMMUNICATIONS

Realtek 802.11 b/g/n (1x1)

|                               |                                                                                                                                                                                                                                                                                                                                                                                                           |
|-------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Wireless LAN Standards</b> | IEEE 802.11b<br>IEEE 802.11g<br><br>IEEE 802.11n                                                                                                                                                                                                                                                                                                                                                          |
| <b>Interoperability</b>       | Wi-Fi certified                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Frequency Band</b>         | 802.11b/g/n <ul style="list-style-type: none"> <li>2.402 – 2.482 GHz</li> </ul> <p><b>Note:</b><br/>The FCC has declared as of September 1, 2014 products that utilize passive scanning on channel 12/13 and are capable of transmitting must fully comply with requirements of 15.247 or otherwise disable those channels.</p>                                                                           |
| <b>Data Rates</b>             | 802.11b: 1, 2, 5.5, 11 Mbps<br>802.11g: 6, 9, 12, 18, 24, 36, 48, 54 Mbps<br>802.11n: MCS 0 ~ MCS 07, (20MHz)                                                                                                                                                                                                                                                                                             |
| <b>Modulation</b>             | Direct Sequence Spread Spectrum<br>BPSK, QPSK, CCK, 16-QAM, 64-QAM,                                                                                                                                                                                                                                                                                                                                       |
| <b>Security<sup>1</sup></b>   | <ul style="list-style-type: none"> <li>IEEE and WiFi compliant 64 / 128 bit WEP encryption for a/b/g mode only</li> <li>AES-CCMP: 128 bit in hardware</li> <li>802.1x authentication</li> <li>WPA, WPA2: 802.1x. WPA-PSK, WPA2-PSK, TKIP, and AES.</li> <li>WPA2 certification</li> <li>IEEE 802.11i</li> <li>Cisco Certified Extensions, all versions through CCX4 and CCX Lite</li> <li>WAPI</li> </ul> |



### Technical Specifications

|                                         |                                                                                                                                                                                                                                                                                                                                        |
|-----------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <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 : +16dBm minimum</li> <li>802.11g : +14dBm minimum</li> <li>802.11a : +14dBm minimum</li> <li>802.11n HT20(2.4GHz) : +13dBm minimum</li> <li>802.11n HT40(2.4GHz) : +13dBm minimum</li> <li>802.11n HT20(5GHz) : +12dBm minimum</li> <li>802.11n HT40(5GHz) : +12dBm minimum</li> </ul> |
| <b>Power Consumption</b>                | Transmit: 2.0 W (max)<br><br>Receive: 1.6 W (max)<br><br>Idle mode (PSP): 180 mW (WLAN Associated)<br><br>Idle mode: 60 mW (WLAN unassociated)<br><br>Radio disabled: 30 mW                                                                                                                                                            |
| <b>Power Management</b>                 | ACPI and PCI Express compliant power management<br>802.11 compliant power saving mode                                                                                                                                                                                                                                                  |
| <b>Receiver Sensitivity<sup>3</sup></b> | 802.11b, 1Mbps : -94dBm maximum<br><br>802.11b, 11Mbps : -86dBm maximum<br><br>802.11g, 6Mbps : -88dBm maximum<br><br>802.11g, 54Mbps : -74dBm maximum<br><br>802.11a, 6Mbps : -86dBm maximum<br><br>802.11a, 54Mbps : -72dBm maximum<br><br>802.11n, MCS07 : -69dBm maximum<br><br>802.11n, MCS15 : -66dBm maximum                    |
| <b>Antenna type</b>                     | High efficiency antenna with spatial diversity, mounted in the display enclosure<br><br>Two embedded 2.4 GHz antennas are provided to the card to support WLAN and Bluetooth communications                                                                                                                                            |



### Technical Specifications

|                          |                                                                          |
|--------------------------|--------------------------------------------------------------------------|
|                          | (Support Dual antenna or Single antenna, depend on platform requirement) |
| <b>Form Factor</b>       | PCI-Express M.2 MiniCard                                                 |
| <b>Dimensions</b>        | Type 2230 : 2.3 x 22.0 x 30.0 mm                                         |
|                          | Or                                                                       |
|                          | Type 1630 : 2.3 x 16.0 x 30.0 mm                                         |
| <b>Weight</b>            | Type 2230 : 2.8g                                                         |
|                          | Or                                                                       |
|                          | Type 1630 : 2g                                                           |
| <b>Operating Voltage</b> | 3.3v +/- 9%                                                              |
| <b>Temperature</b>       | Operating<br>Non-operating                                               |
| <b>Humidity</b>          | Operating<br>Non-operating                                               |
| <b>Altitude</b>          | Operating<br>Non-operating                                               |
| <b>LED Activity</b>      | LED Amber – Radio OFF; LED White – Radio ON                              |

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

#### Realtek 802.11 b/g/n (1x1) + Bluetooth® Combo

|                               |                                                  |
|-------------------------------|--------------------------------------------------|
| <b>Wireless LAN Standards</b> | IEEE 802.11b<br>IEEE 802.11g<br><br>IEEE 802.11n |
| <b>Interoperability</b>       | Wi-Fi certified                                  |
| <b>Frequency Band</b>         | 802.11b/g/n                                      |



### Technical Specifications

|                                         |                                                                                                                                                                                                                                                                                                                                                                                                           |
|-----------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                         | <ul style="list-style-type: none"> <li>2.402 – 2.482 GHz</li> </ul> <p><b>Note:</b><br/>The FCC has declared as of September 1, 2014 products that utilize passive scanning on channel 12/13 and are capable of transmitting must fully comply with requirements of 15.247 or otherwise disable those channels.</p>                                                                                       |
| <b>Data Rates</b>                       | 802.11b: 1, 2, 5.5, 11 Mbps<br>802.11g: 6, 9, 12, 18, 24, 36, 48, 54 Mbps<br>802.11n: MCS 0 ~ MCS 07, (20MHz)                                                                                                                                                                                                                                                                                             |
| <b>Modulation</b>                       | Direct Sequence Spread Spectrum<br>BPSK, QPSK, CCK, 16-QAM, 64-QAM,                                                                                                                                                                                                                                                                                                                                       |
| <b>Security<sup>1</sup></b>             | <ul style="list-style-type: none"> <li>IEEE and WiFi compliant 64 / 128 bit WEP encryption for a/b/g mode only</li> <li>AES-CCMP: 128 bit in hardware</li> <li>802.1x authentication</li> <li>WPA, WPA2: 802.1x, WPA-PSK, WPA2-PSK, TKIP, and AES.</li> <li>WPA2 certification</li> <li>IEEE 802.11i</li> <li>Cisco Certified Extensions, all versions through CCX4 and CCX Lite</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 : +16dBm minimum</li> <li>802.11g : +14dBm minimum</li> <li>802.11n HT20(2.4GHz) : +13dBm minimum</li> <li>802.11n HT40(2.4GHz) : +13dBm minimum</li> <li>802.11n HT20(5GHz) : +12dBm minimum</li> <li>802.11n HT40(5GHz) : +12dBm minimum</li> </ul>                                                                                                      |
| <b>Power Consumption</b>                | Transmit: 2.0 W (max)<br>Receive: 1.6 W (max)<br>Idle mode (PSP): 180 mW (WLAN Associated)<br>Idle mode: 60 mW (WLAN unassociated)<br><br>Radio disabled: 30 mW                                                                                                                                                                                                                                           |
| <b>Power Management</b>                 | ACPI and PCI Express compliant power management<br>802.11 compliant power saving mode                                                                                                                                                                                                                                                                                                                     |
| <b>Receiver Sensitivity<sup>3</sup></b> | 802.11b, 1Mbps : -94dBm maximum<br><br>802.11b, 11Mbps : -86dBm maximum                                                                                                                                                                                                                                                                                                                                   |



### Technical Specifications

|                          |                                                                                                                                                                                     |                                |
|--------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|
|                          | 802.11g, 6Mbps : -88dBm maximum                                                                                                                                                     |                                |
|                          | 802.11g, 54Mbps : -74dBm maximum                                                                                                                                                    |                                |
|                          | 802.11n, MCS07 : -69dBm maximum                                                                                                                                                     |                                |
|                          | 802.11n, MCS15 : -66dBm maximum                                                                                                                                                     |                                |
| <b>Antenna type</b>      | High efficiency antenna with spatial diversity, mounted in the display enclosure                                                                                                    |                                |
|                          | Two embedded antennas for 2.4GHz are provided to the card to support WLAN and Bluetooth communications.<br>(Support Dual antenna or Single antenna, depend on platform requirement) |                                |
| <b>Form Factor</b>       | PCI-Express M.2 MiniCard                                                                                                                                                            |                                |
| <b>Dimensions</b>        | Type 2230 : 2.3 x 22.0 x 30.0 mm                                                                                                                                                    |                                |
|                          | Or                                                                                                                                                                                  |                                |
|                          | Type 1630 : 2.3 x 16.0 x 30.0 mm                                                                                                                                                    |                                |
| <b>Weight</b>            | Type 2230 : 2.8g                                                                                                                                                                    |                                |
|                          | Or                                                                                                                                                                                  |                                |
|                          | Type 1630 : 2g                                                                                                                                                                      |                                |
| <b>Operating Voltage</b> | 3.3v +/- 9%                                                                                                                                                                         |                                |
| <b>Temperature</b>       | Operating                                                                                                                                                                           | 14° to 158° F (–10° to 70° C)  |
|                          | Non-operating                                                                                                                                                                       | –40° to 176° F (–40° to 80° C) |
| <b>Humidity</b>          | Operating                                                                                                                                                                           | 10% to 90% (non-condensing)    |
|                          | Non-operating                                                                                                                                                                       | 5% to 95% (non-condensing)     |
| <b>Altitude</b>          | Operating                                                                                                                                                                           | 0 to 10,000 ft (3,048 m)       |
|                          | Non-operating                                                                                                                                                                       | 0 to 50,000 ft (15,240 m)      |
| <b>LED Activity</b>      | LED Amber – Radio OFF; LED White – Radio ON                                                                                                                                         |                                |

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



### Technical Specifications

#### HP Integrated Module with Bluetooth 4.0+EDR Wireless Technology

| <b>Bluetooth Specification</b>      | 4.0+EDR Compliant                                                                                                                                                                                                                                                                                                             |            |            |           |            |      |         |         |                |         |         |       |         |         |
|-------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|------------|-----------|------------|------|---------|---------|----------------|---------|---------|-------|---------|---------|
| <b>Frequency Band</b>               | 2402 to 2480 MHz                                                                                                                                                                                                                                                                                                              |            |            |           |            |      |         |         |                |         |         |       |         |         |
| <b>Number of Available Channels</b> | 79 (1 MHz) available channels                                                                                                                                                                                                                                                                                                 |            |            |           |            |      |         |         |                |         |         |       |         |         |
| <b>Data Rates and Throughput</b>    | <p>3 Mbps data rate; throughput up to 2.17 Mbps</p> <p>Synchronous Connection Oriented links up to 3, 64 kbps, voice channels</p> <p>Asynchronous Connection Less links 2178.1 kbps/177.1 kbps asymmetric or 1306.9 kbps symmetric</p>                                                                                        |            |            |           |            |      |         |         |                |         |         |       |         |         |
| <b>Transmit Power</b>               | The Bluetooth component shall operate as a Class II Bluetooth device with a maximum transmit power of +4 dBm for BR and EDR.                                                                                                                                                                                                  |            |            |           |            |      |         |         |                |         |         |       |         |         |
| <b>Receiver Sensitivity</b>         | <table border="1"> <thead> <tr> <th>Modulation</th><th>0.01% BER</th><th>0.001% BER</th></tr> </thead> <tbody> <tr> <td>GFSK</td><td>-80 dBm</td><td>-70 dBm</td></tr> <tr> <td><math>\pi/4</math>-DQPSK</td><td>-80 dBm</td><td>-70 dBm</td></tr> <tr> <td>8DPSK</td><td>-80 dBm</td><td>-70 dBm</td></tr> </tbody> </table> |            | Modulation | 0.01% BER | 0.001% BER | GFSK | -80 dBm | -70 dBm | $\pi/4$ -DQPSK | -80 dBm | -70 dBm | 8DPSK | -80 dBm | -70 dBm |
| Modulation                          | 0.01% BER                                                                                                                                                                                                                                                                                                                     | 0.001% BER |            |           |            |      |         |         |                |         |         |       |         |         |
| GFSK                                | -80 dBm                                                                                                                                                                                                                                                                                                                       | -70 dBm    |            |           |            |      |         |         |                |         |         |       |         |         |
| $\pi/4$ -DQPSK                      | -80 dBm                                                                                                                                                                                                                                                                                                                       | -70 dBm    |            |           |            |      |         |         |                |         |         |       |         |         |
| 8DPSK                               | -80 dBm                                                                                                                                                                                                                                                                                                                       | -70 dBm    |            |           |            |      |         |         |                |         |         |       |         |         |
| <b>Power Consumption</b>            | <p>Peak (Tx) 330 mW</p> <p>Peak (Rx) 230 mW</p> <p>Selective Suspend 17 mW</p>                                                                                                                                                                                                                                                |            |            |           |            |      |         |         |                |         |         |       |         |         |
| <b>Range</b>                        | Up to 33 ft (10 m)                                                                                                                                                                                                                                                                                                            |            |            |           |            |      |         |         |                |         |         |       |         |         |
| <b>Electrical Interface</b>         | USB 2.0 compliant                                                                                                                                                                                                                                                                                                             |            |            |           |            |      |         |         |                |         |         |       |         |         |
| <b>Bluetooth Software Supported</b> | Microsoft Windows Bluetooth Software                                                                                                                                                                                                                                                                                          |            |            |           |            |      |         |         |                |         |         |       |         |         |
| <b>Link Topology</b>                |                                                                                                                                                                                                                                                                                                                               |            |            |           |            |      |         |         |                |         |         |       |         |         |
| <b>Electrical Interface</b>         | Point to Point, Multipoint Pico Nets up to 7 slaves                                                                                                                                                                                                                                                                           |            |            |           |            |      |         |         |                |         |         |       |         |         |
| <b>Bluetooth Software Supported</b> | Full support of Bluetooth Security Provisions                                                                                                                                                                                                                                                                                 |            |            |           |            |      |         |         |                |         |         |       |         |         |
| <b>Security</b>                     |                                                                                                                                                                                                                                                                                                                               |            |            |           |            |      |         |         |                |         |         |       |         |         |



### Technical Specifications

|                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|-------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Power Management</b>             | Microsoft Windows ACPI, and USB Bus Support                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Power Management</b>             | Self-configurable to optimize power conservation in all operating modes, including Standby, Hold, Park, and Sniff                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Certifications</b>               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Security</b>                     | All necessary regulatory approvals for supported countries, including:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Certifications</b>               | FCC (47 CFR) Part 15C, Section 15.247 & 15.249                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Bluetooth Profiles Supported</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Power Management</b>             | ETS 300 328, ETS 300 826                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Certifications</b>               | Low Voltage Directive IEC950                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|                                     | UL, CSA, and CE Mark                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Certifications</b>               | Serial Port Profile (SPP) <sup>1</sup><br>Service Discovery Application Profile (SDAP)<br>Dial-Up Networking (DUN) <sup>1,2</sup><br>Generic Object Exchange Profile (GOEP) <sup>1,2</sup><br>Object Push Profile (OPP) <sup>1,2</sup><br>File Transfer Profile (FTP)<br>Synchronization Profile (SYNC)<br>Hard Copy Cable Replacement (HCRP) <sup>1,2</sup><br>Personal Area Networking Profile (PAN) <sup>1,2</sup><br>Human Interface Device Profile (HID) <sup>1,2</sup><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) |
| <b>Bluetooth Profiles Supported</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |

#### Broadcom 802.11 b/g/n (1x1) + Bluetooth® Combo

|                               |                                                  |
|-------------------------------|--------------------------------------------------|
| <b>Wireless LAN Standards</b> | IEEE 802.11b<br>IEEE 802.11g<br><br>IEEE 802.11n |
| <b>Interoperability</b>       | Wi-Fi certified                                  |
| <b>Frequency Band</b>         | 802.11b/g/n                                      |



### Technical Specifications

|                                         |                                                                                                                                                                                                                                                                                                                                                                                                           |
|-----------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                         | <ul style="list-style-type: none"> <li>2.402 – 2.482 GHz</li> </ul> <p><b>Note:</b><br/>The FCC has declared as of September 1, 2014 products that utilize passive scanning on channel 12/13 and are capable of transmitting must fully comply with requirements of 15.247 or otherwise disable those channels.</p>                                                                                       |
| <b>Data Rates</b>                       | 802.11b: 1, 2, 5.5, 11 Mbps<br>802.11g: 6, 9, 12, 18, 24, 36, 48, 54 Mbps<br>802.11n: MCS 0 ~ MCS 07, (20MHz)                                                                                                                                                                                                                                                                                             |
| <b>Modulation</b>                       | Direct Sequence Spread Spectrum<br>BPSK, QPSK, CCK, 16-QAM, 64-QAM,                                                                                                                                                                                                                                                                                                                                       |
| <b>Security<sup>1</sup></b>             | <ul style="list-style-type: none"> <li>IEEE and WiFi compliant 64 / 128 bit WEP encryption for a/b/g mode only</li> <li>AES-CCMP: 128 bit in hardware</li> <li>802.1x authentication</li> <li>WPA, WPA2: 802.1x, WPA-PSK, WPA2-PSK, TKIP, and AES.</li> <li>WPA2 certification</li> <li>IEEE 802.11i</li> <li>Cisco Certified Extensions, all versions through CCX4 and CCX Lite</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 : +16dBm minimum</li> <li>802.11g : +14dBm minimum</li> <li>802.11n HT20(2.4GHz) : +13dBm minimum</li> <li>802.11n HT40(2.4GHz) : +13dBm minimum</li> <li>802.11n HT20(5GHz) : +12dBm minimum</li> <li>802.11n HT40(5GHz) : +12dBm minimum</li> </ul>                                                                                                      |
| <b>Power Consumption</b>                | Transmit: 2.0 W (max)<br>Receive: 1.6 W (max)<br>Idle mode (PSP): 180 mW (WLAN Associated)<br>Idle mode: 60 mW (WLAN unassociated)<br><br>Radio disabled: 30 mW                                                                                                                                                                                                                                           |
| <b>Power Management</b>                 | ACPI and PCI Express compliant power management<br>802.11 compliant power saving mode                                                                                                                                                                                                                                                                                                                     |
| <b>Receiver Sensitivity<sup>3</sup></b> | 802.11b, 1Mbps : -94dBm maximum<br><br>802.11b, 11Mbps : -86dBm maximum                                                                                                                                                                                                                                                                                                                                   |



### Technical Specifications

|                          |                                                                                                                                                                                     |                                |
|--------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|
|                          | 802.11g, 6Mbps : -88dBm maximum                                                                                                                                                     |                                |
|                          | 802.11g, 54Mbps : -74dBm maximum                                                                                                                                                    |                                |
|                          | 802.11n, MCS07 : -69dBm maximum                                                                                                                                                     |                                |
|                          | 802.11n, MCS15 : -66dBm maximum                                                                                                                                                     |                                |
| <b>Antenna type</b>      | High efficiency antenna with spatial diversity, mounted in the display enclosure                                                                                                    |                                |
|                          | Two embedded antennas for 2.4GHz are provided to the card to support WLAN and Bluetooth communications.<br>(Support Dual antenna or Single antenna, depend on platform requirement) |                                |
| <b>Form Factor</b>       | PCI-Express M.2 MiniCard                                                                                                                                                            |                                |
| <b>Dimensions</b>        | Type 2230 : 2.3 x 22.0 x 30.0 mm                                                                                                                                                    |                                |
|                          | Or                                                                                                                                                                                  |                                |
|                          | Type 1630 : 2.3 x 16.0 x 30.0 mm                                                                                                                                                    |                                |
| <b>Weight</b>            | Type 2230 : 2.8g                                                                                                                                                                    |                                |
|                          | Or                                                                                                                                                                                  |                                |
|                          | Type 1630 : 2g                                                                                                                                                                      |                                |
| <b>Operating Voltage</b> | 3.3v +/- 9%                                                                                                                                                                         |                                |
| <b>Temperature</b>       | Operating                                                                                                                                                                           | 14° to 158° F (–10° to 70° C)  |
|                          | Non-operating                                                                                                                                                                       | –40° to 176° F (–40° to 80° C) |
| <b>Humidity</b>          | Operating                                                                                                                                                                           | 10% to 90% (non-condensing)    |
|                          | Non-operating                                                                                                                                                                       | 5% to 95% (non-condensing)     |
| <b>Altitude</b>          | Operating                                                                                                                                                                           | 0 to 10,000 ft (3,048 m)       |
|                          | Non-operating                                                                                                                                                                       | 0 to 50,000 ft (15,240 m)      |
| <b>LED Activity</b>      | LED Amber – Radio OFF; LED White – Radio ON                                                                                                                                         |                                |

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



### Technical Specifications

#### HP Integrated Module with Bluetooth 4.0+EDR Wireless Technology

| <b>Bluetooth Specification</b>      | 4.0+EDR Compliant                                                                                                                                                                                                                                                                                                             |            |            |           |            |      |         |         |                |         |         |       |         |         |
|-------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|------------|-----------|------------|------|---------|---------|----------------|---------|---------|-------|---------|---------|
| <b>Frequency Band</b>               | 2402 to 2480 MHz                                                                                                                                                                                                                                                                                                              |            |            |           |            |      |         |         |                |         |         |       |         |         |
| <b>Number of Available Channels</b> | 79 (1 MHz) available channels                                                                                                                                                                                                                                                                                                 |            |            |           |            |      |         |         |                |         |         |       |         |         |
| <b>Data Rates and Throughput</b>    | <p>3 Mbps data rate; throughput up to 2.17 Mbps</p> <p>Synchronous Connection Oriented links up to 3, 64 kbps, voice channels</p> <p>Asynchronous Connection Less links 2178.1 kbps/177.1 kbps asymmetric or 1306.9 kbps symmetric</p>                                                                                        |            |            |           |            |      |         |         |                |         |         |       |         |         |
| <b>Transmit Power</b>               | The Bluetooth component shall operate as a Class II Bluetooth device with a maximum transmit power of +4 dBm for BR and EDR.                                                                                                                                                                                                  |            |            |           |            |      |         |         |                |         |         |       |         |         |
| <b>Receiver Sensitivity</b>         | <table border="1"> <thead> <tr> <th>Modulation</th><th>0.01% BER</th><th>0.001% BER</th></tr> </thead> <tbody> <tr> <td>GFSK</td><td>-80 dBm</td><td>-70 dBm</td></tr> <tr> <td><math>\pi/4</math>-DQPSK</td><td>-80 dBm</td><td>-70 dBm</td></tr> <tr> <td>8DPSK</td><td>-80 dBm</td><td>-70 dBm</td></tr> </tbody> </table> |            | Modulation | 0.01% BER | 0.001% BER | GFSK | -80 dBm | -70 dBm | $\pi/4$ -DQPSK | -80 dBm | -70 dBm | 8DPSK | -80 dBm | -70 dBm |
| Modulation                          | 0.01% BER                                                                                                                                                                                                                                                                                                                     | 0.001% BER |            |           |            |      |         |         |                |         |         |       |         |         |
| GFSK                                | -80 dBm                                                                                                                                                                                                                                                                                                                       | -70 dBm    |            |           |            |      |         |         |                |         |         |       |         |         |
| $\pi/4$ -DQPSK                      | -80 dBm                                                                                                                                                                                                                                                                                                                       | -70 dBm    |            |           |            |      |         |         |                |         |         |       |         |         |
| 8DPSK                               | -80 dBm                                                                                                                                                                                                                                                                                                                       | -70 dBm    |            |           |            |      |         |         |                |         |         |       |         |         |
| <b>Power Consumption</b>            | <p>Peak (Tx) 330 mW</p> <p>Peak (Rx) 230 mW</p> <p>Selective Suspend 17 mW</p>                                                                                                                                                                                                                                                |            |            |           |            |      |         |         |                |         |         |       |         |         |
| <b>Range</b>                        | Up to 33 ft (10 m)                                                                                                                                                                                                                                                                                                            |            |            |           |            |      |         |         |                |         |         |       |         |         |
| <b>Electrical Interface</b>         | USB 2.0 compliant                                                                                                                                                                                                                                                                                                             |            |            |           |            |      |         |         |                |         |         |       |         |         |
| <b>Bluetooth Software Supported</b> | Microsoft Windows Bluetooth Software                                                                                                                                                                                                                                                                                          |            |            |           |            |      |         |         |                |         |         |       |         |         |
| <b>Link Topology</b>                |                                                                                                                                                                                                                                                                                                                               |            |            |           |            |      |         |         |                |         |         |       |         |         |
| <b>Electrical Interface</b>         | Point to Point, Multipoint Pico Nets up to 7 slaves                                                                                                                                                                                                                                                                           |            |            |           |            |      |         |         |                |         |         |       |         |         |
| <b>Bluetooth Software Supported</b> | Full support of Bluetooth Security Provisions                                                                                                                                                                                                                                                                                 |            |            |           |            |      |         |         |                |         |         |       |         |         |
| <b>Security</b>                     |                                                                                                                                                                                                                                                                                                                               |            |            |           |            |      |         |         |                |         |         |       |         |         |



### Technical Specifications

|                                     |                                                                                                                                                                                                                                                                                                                                                                         |
|-------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Power Management</b>             | Microsoft Windows ACPI, and USB Bus Support                                                                                                                                                                                                                                                                                                                             |
| <b>Power Management</b>             | Self-configurable to optimize power conservation in all operating modes, including Standby, Hold, Park, and Sniff                                                                                                                                                                                                                                                       |
| <b>Certifications</b>               |                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Security</b>                     | All necessary regulatory approvals for supported countries, including:                                                                                                                                                                                                                                                                                                  |
| <b>Certifications</b>               | FCC (47 CFR) Part 15C, Section 15.247 & 15.249                                                                                                                                                                                                                                                                                                                          |
| <b>Bluetooth Profiles Supported</b> |                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Power Management</b>             | ETS 300 328, ETS 300 826                                                                                                                                                                                                                                                                                                                                                |
| <b>Certifications</b>               | Low Voltage Directive IEC950                                                                                                                                                                                                                                                                                                                                            |
|                                     | UL, CSA, and CE Mark                                                                                                                                                                                                                                                                                                                                                    |
| <b>Certifications</b>               | Serial Port Profile (SPP) <sup>1</sup><br>Service Discovery Application Profile (SDAP)<br>Dial-Up Networking (DUN) <sup>1,2</sup><br>Generic Object Exchange Profile (GOEP) <sup>1,2</sup><br>Object Push Profile (OPP) <sup>1,2</sup><br>File Transfer Profile (FTP)                                                                                                   |
| <b>Bluetooth Profiles Supported</b> | Synchronization Profile (SYNC)<br>Hard Copy Cable Replacement (HCRP) <sup>1,2</sup><br>Personal Area Networking Profile (PAN) <sup>1,2</sup><br>Human Interface Device Profile (HID) <sup>1,2</sup><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) |

#### Broadcom 802.11 a/b/g/n (2x2) + Bluetooth® Combo

|                               |                                                                                 |
|-------------------------------|---------------------------------------------------------------------------------|
| <b>Wireless LAN Standards</b> | IEEE 802.11a<br>IEEE 802.11b<br>IEEE 802.11g<br>IEEE 802.11n                    |
| <b>Interoperability</b>       | Wi-Fi certified                                                                 |
| <b>Frequency Band</b>         | 802.11b/g/n <ul style="list-style-type: none"> <li>2.402 – 2.482 GHz</li> </ul> |



### Technical Specifications

#### Note:

The FCC has declared as of January 1, 2015 products that utilize passive scanning on channel 12/13 and are capable of transmitting must fully comply with requirements of 15.247 or otherwise disable those channels.

#### 802.11a

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

#### Note:

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

#### Antenna Structure

2 transmit; 2 receive (2x2)

#### Data Rates

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

#### Modulation

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

#### Security<sup>1</sup>

- IEEE and WiFi compliant 64 / 128 bit WEP encryption for a/b/g mode only
- AES-CCMP: 128 bit in hardware
- 802.1x authentication
- WPA, WPA2: 802.1x. WPA-PSK, WPA2-PSK, TKIP, and AES.
- WPA2 certification
- IEEE 802.11i
- Cisco Certified Extensions, all versions through CCX4 and CCX Lite
- WAPI

#### Sub-channels

Multinational support with frequency bands and channels compliant to local regulations.



### Technical Specifications

|                                         |                                                                                                                                                                                                                                                                                                                                                      |
|-----------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Network Architecture Models</b>      | Ad-hoc (Peer to Peer)<br>Infrastructure (Access Point Required)                                                                                                                                                                                                                                                                                      |
| <b>Roaming</b>                          | IEEE 802.11 compliant roaming between band Access Points                                                                                                                                                                                                                                                                                             |
| <b>Output Power<sup>2</sup></b>         | <ul style="list-style-type: none"> <li>• 802.11b : +16dBm minimum</li> <li>• 802.11g : +14dBm minimum</li> <li>• 802.11a : +14dBm minimum</li> <li>• 802.11n HT20(2.4GHz) : +13dBm minimum</li> <li>• 802.11n HT40(2.4GHz) : +13dBm minimum</li> <li>• 802.11n HT20(5GHz) : +12dBm minimum</li> <li>• 802.11n HT40(5GHz) : +12dBm minimum</li> </ul> |
| <b>Power Consumption</b>                | Transmit: 2.0 W (max)<br><br>Receive: 1.6 W (max)<br><br>Idle mode (PSP): 180 mW (WLAN Associated)<br><br>Idle mode: 60 mW (WLAN unassociated)<br><br>Radio disabled: 30 mW                                                                                                                                                                          |
| <b>Power Management</b>                 | ACPI and PCI Express compliant power management<br>802.11 compliant power saving mode                                                                                                                                                                                                                                                                |
| <b>Receiver Sensitivity<sup>3</sup></b> | 802.11b, 1Mbps : -94dBm maximum<br>802.11b, 11Mbps : -86dBm maximum<br>802.11g, 6Mbps : -88dBm maximum<br>802.11g, 54Mbps : -74dBm maximum<br>802.11a, 6Mbps : -86dBm maximum<br>802.11a, 54Mbps : -72dBm maximum<br>802.11n, MCS07 : -69dBm maximum<br>802.11n, MCS15 : -66dBm maximum                                                              |
| <b>Antenna type</b>                     | High efficiency antenna with spatial diversity, mounted in the display enclosure<br><br>Two embedded dual band 2.4/5 GHz antennas are provided to the card to support WLAN MIMO and Bluetooth communications                                                                                                                                         |
| <b>Form Factor</b>                      | PCI-Express M.2 MiniCard                                                                                                                                                                                                                                                                                                                             |
| <b>Dimensions</b>                       | Type 2230 : 2.3 x 22.0 x 30.0 mm<br><br>Or<br>Type 1630 : 2.3 x 16.0 x 30.0 mm                                                                                                                                                                                                                                                                       |



### Technical Specifications

|                          |                                             |                                |
|--------------------------|---------------------------------------------|--------------------------------|
| <b>Weight</b>            | Type 2230 : 2.8g                            |                                |
|                          | Or                                          |                                |
|                          | Type 1630 : 2g                              |                                |
| <b>Operating Voltage</b> | 3.3v +/- 9%                                 |                                |
| <b>Temperature</b>       | Operating                                   | 14° to 158° F (-10° to 70° C)  |
|                          | Non-operating                               | -40° to 176° F (-40° to 80° C) |
| <b>Humidity</b>          | Operating                                   | 10% to 90% (non-condensing)    |
|                          | Non-operating                               | 5% to 95% (non-condensing)     |
| <b>Altitude</b>          | Operating                                   | 0 to 10,000 ft (3,048 m)       |
|                          | Non-operating                               | 0 to 50,000 ft (15,240 m)      |
| <b>LED Activity</b>      | LED Amber - Radio OFF; LED White - Radio ON |                                |

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

#### HP Integrated Module with Bluetooth 4.0+EDR Wireless Technology

|                                     |                                                                                                                              |                  |                   |
|-------------------------------------|------------------------------------------------------------------------------------------------------------------------------|------------------|-------------------|
| <b>Bluetooth Specification</b>      | 4.0+EDR Compliant                                                                                                            |                  |                   |
| <b>Frequency Band</b>               | 2402 to 2480 MHz                                                                                                             |                  |                   |
| <b>Number of Available Channels</b> | 79 (1 MHz) available channels                                                                                                |                  |                   |
| <b>Data Rates and Throughput</b>    | 3 Mbps data rate; throughput up to 2.17 Mbps                                                                                 |                  |                   |
|                                     | Synchronous Connection Oriented links up to 3, 64 kbps, voice channels                                                       |                  |                   |
|                                     | Asynchronous Connection Less links 2178.1 kbps/177.1 kbps asymmetric or 1306.9 kbps symmetric                                |                  |                   |
| <b>Transmit Power</b>               | The Bluetooth component shall operate as a Class II Bluetooth device with a maximum transmit power of +4 dBm for BR and EDR. |                  |                   |
| <b>Receiver Sensitivity</b>         | <b>Modulation</b>                                                                                                            | <b>0.01% BER</b> | <b>0.001% BER</b> |
|                                     |                                                                                                                              |                  |                   |



### Technical Specifications

|                                     |                                                                                                                                                                                                                             |         |         |         |                |         |         |       |         |         |
|-------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|---------|---------|----------------|---------|---------|-------|---------|---------|
|                                     | <table><tr><td>GFSK</td><td>-80 dBm</td><td>-70 dBm</td></tr><tr><td><math>\pi/4</math>-DQPSK</td><td>-80 dBm</td><td>-70 dBm</td></tr><tr><td>8DPSK</td><td>-80 dBm</td><td>-70 dBm</td></tr></table>                      | GFSK    | -80 dBm | -70 dBm | $\pi/4$ -DQPSK | -80 dBm | -70 dBm | 8DPSK | -80 dBm | -70 dBm |
| GFSK                                | -80 dBm                                                                                                                                                                                                                     | -70 dBm |         |         |                |         |         |       |         |         |
| $\pi/4$ -DQPSK                      | -80 dBm                                                                                                                                                                                                                     | -70 dBm |         |         |                |         |         |       |         |         |
| 8DPSK                               | -80 dBm                                                                                                                                                                                                                     | -70 dBm |         |         |                |         |         |       |         |         |
| <b>Power Consumption</b>            | Peak (Tx) 330 mW<br>Peak (Rx) 230 mW<br>Selective Suspend 17 mW                                                                                                                                                             |         |         |         |                |         |         |       |         |         |
| <b>Range</b>                        | Up to 33 ft (10 m)                                                                                                                                                                                                          |         |         |         |                |         |         |       |         |         |
| <b>Electrical Interface</b>         | USB 2.0 compliant                                                                                                                                                                                                           |         |         |         |                |         |         |       |         |         |
| <b>Bluetooth Software Supported</b> | Microsoft Windows Bluetooth Software                                                                                                                                                                                        |         |         |         |                |         |         |       |         |         |
| <b>Link Topology</b>                |                                                                                                                                                                                                                             |         |         |         |                |         |         |       |         |         |
| <b>Electrical Interface</b>         | Point to Point, Multipoint Pico Nets up to 7 slaves                                                                                                                                                                         |         |         |         |                |         |         |       |         |         |
| <b>Bluetooth Software Supported</b> | Full support of Bluetooth Security Provisions                                                                                                                                                                               |         |         |         |                |         |         |       |         |         |
| <b>Security</b>                     |                                                                                                                                                                                                                             |         |         |         |                |         |         |       |         |         |
| <b>Power Management</b>             | Microsoft Windows ACPI, and USB Bus Support                                                                                                                                                                                 |         |         |         |                |         |         |       |         |         |
| <b>Power Management</b>             | Self-configurable to optimize power conservation in all operating modes, including Standby, Hold, Park, and Sniff                                                                                                           |         |         |         |                |         |         |       |         |         |
| <b>Certifications</b>               |                                                                                                                                                                                                                             |         |         |         |                |         |         |       |         |         |
| <b>Security</b>                     | All necessary regulatory approvals for supported countries, including:                                                                                                                                                      |         |         |         |                |         |         |       |         |         |
| <b>Certifications</b>               | FCC (47 CFR) Part 15C, Section 15.247 & 15.249                                                                                                                                                                              |         |         |         |                |         |         |       |         |         |
| <b>Bluetooth Profiles Supported</b> |                                                                                                                                                                                                                             |         |         |         |                |         |         |       |         |         |
| <b>Power Management</b>             | ETS 300 328, ETS 300 826                                                                                                                                                                                                    |         |         |         |                |         |         |       |         |         |
| <b>Certifications</b>               | Low Voltage Directive IEC950<br><br>UL, CSA, and CE Mark                                                                                                                                                                    |         |         |         |                |         |         |       |         |         |
| <b>Certifications</b>               | Serial Port Profile (SPP) <sup>1</sup>                                                                                                                                                                                      |         |         |         |                |         |         |       |         |         |
| <b>Bluetooth Profiles Supported</b> | Service Discovery Application Profile (SDAP)<br>Dial-Up Networking (DUN) <sup>1,2</sup><br>Generic Object Exchange Profile (GOEP) <sup>1,2</sup><br>Object Push Profile (OPP) <sup>1,2</sup><br>File Transfer Profile (FTP) |         |         |         |                |         |         |       |         |         |



### Technical Specifications

Synchronization Profile (SYNC)  
 Hard Copy Cable Replacement (HCRP)<sup>1,2</sup>  
 Personal Area Networking Profile (PAN)<sup>1,2</sup>  
 Human Interface Device Profile (HID)<sup>1,2</sup>  
 FAX Profile (FAX)  
 Basic Imaging Profile (BIP)<sup>2</sup>  
 Headset Profile (HSP)  
 Hands Free Profile (HFP)  
 Advanced Audio Distribution Profile (A2DP)

|                                           |                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|-------------------------------------------|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Realtek Ethernet<br/>(10/100/1000)</b> | <b>Ethernet Features</b>      | 10 Mbit/s operation (10BASE-T; IEEE 802.3i; 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<br>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)<br>Jumbo Frame 9K<br>Auto MDI/MDIX Crossover cable detection |
|                                           | <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>Performance Features</b>   | TCP/IP/UDP Checksum Offload (configurable)<br>Protocol Offload (ARP & NS)<br>Large send offload and Giant send offload<br>Receiving Side Scaling                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|                                           | <b>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>Interface</b>              | PCI Express 1.1 to fully support ASPM L0s/L1 and CLKREQ                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|                                           | <b>NIC Device Driver Name</b> | Realtek PCIe GBE Ethernet Family Controller                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |



### Technical Specifications

#### AUDIO/MULTIMEDIA

##### DTS Studio Sound™

|                                   |                                     |                                    |
|-----------------------------------|-------------------------------------|------------------------------------|
| <b>Hardware</b>                   | <b>Implementation</b>               | Conexant                           |
|                                   | <b>Function Key Volume Controls</b> | Volume up, volume down, and mute   |
|                                   | <b>Full Duplex</b>                  | Yes                                |
|                                   | <b>Microphone In</b>                | Stereo                             |
|                                   | <b>Headphone/Line Out</b>           | Stereo                             |
|                                   | <b>Integrated Microphone</b>        | Yes, dual digital microphone array |
| <b>Audio Output Quality</b>       | <b>Frequency Response</b>           | 20Hz – 20kHz                       |
|                                   | <b>Signal to Noise Ratio</b>        | 106 dB (DAC), 102dB (ADC)          |
|                                   | <b>Total Harmonic Distortion</b>    | 91dB THD+n on Line Out/HP (0.003%) |
|                                   | <b>Play Sampling Rate(s)</b>        | Up to 192kHz                       |
|                                   | <b>Record Sampling Rate(s)</b>      | Up to 96Khz                        |
|                                   | <b>DAC</b>                          | 16, 20 or 24-bit                   |
| <b>Integrated Stereo Speakers</b> | <b>ADC</b>                          | 16, 20 or 24-bit                   |
|                                   | <b>Power Rating</b>                 | 2 Watts                            |
|                                   | <b>Impedance</b>                    | 4 Ohms                             |

#### SECURITY

**Mobile Voltage Operation** 3.0V-3.6V Single Supply

**Operating Temperature** 32° – 158°F (0° – 70°C)

Not all configuration components are available in all regions/countries.  
c04686339 – DA 15289– World Wide – Version 5 – April 11, 2016



### Technical Specifications

|                                                             |                                   |                                                                                                                      |
|-------------------------------------------------------------|-----------------------------------|----------------------------------------------------------------------------------------------------------------------|
| <b>HP Validity VFM 495 Fingerprint Reader</b><br>(optional) | <b>Current Consumption @ 3.3V</b> | Less than 70 mA peak imaging and scrolling<br>Less than 25 mA hardware finger detection<br>Advanced Power Management |
|                                                             | <b>High-Rate Image Capture</b>    | Up to 240 image frames /sec                                                                                          |
|                                                             | <b>ESD Resistance</b>             | IEC 61000-4-2 Level 4 (±15KV)                                                                                        |
|                                                             | <b>Detection Matrix</b>           | 200 pixel wide fingerpring image<br>16.5 mm x 3 mm sensor area<br>508 dpi resolution, 256 levels of grayscale        |

### POWER

|                                |                                            |                                                                                                                                                                                                                                                                                                          |
|--------------------------------|--------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>HP 65W Smart AC Adapter</b> | <b>Dimensions</b>                          | 4.98 x 1.97 x 1.18 in (12.65 x 5.0 x 3.0 cm)                                                                                                                                                                                                                                                             |
|                                | <b>Weight</b>                              | 0.62 lb (290g) max                                                                                                                                                                                                                                                                                       |
|                                | <b>Input</b>                               | 90 to 265 VAC                                                                                                                                                                                                                                                                                            |
|                                | <b>Input Efficiency</b>                    | 87% min at 115 VAC                                                                                                                                                                                                                                                                                       |
|                                | <b>Input frequency range</b>               | 47 to 63 Hz                                                                                                                                                                                                                                                                                              |
|                                | <b>Input AC current</b>                    | 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 msec at 115 VAC input                                                                                                                                                                                                                                                                                  |
|                                | <b>Output current limit</b>                | <11.0A                                                                                                                                                                                                                                                                                                   |
|                                | <b>Over voltage protection</b>             | < 29V max automatic shutdown                                                                                                                                                                                                                                                                             |
|                                | <b>Over short protection</b>               | Auto-recovery and no damage                                                                                                                                                                                                                                                                              |
|                                | <b>Connector</b>                           | 3 pin/grounded, mates with interchangeable cords                                                                                                                                                                                                                                                         |
|                                | <b>Environmental Design</b>                |                                                                                                                                                                                                                                                                                                          |
|                                | <b>Operating temperature</b>               | 32° to 95° F (0° to 35° C)                                                                                                                                                                                                                                                                               |
|                                | <b>Non-operating (storage) temperature</b> | -4° to 185° F (-20° to 85° C)                                                                                                                                                                                                                                                                            |
|                                | <b>Altitude</b>                            | 0 to 16,400 ft (0 to 5,000 m)                                                                                                                                                                                                                                                                            |
|                                | <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>Dimensions</b> | 3.74 x 1.57 x 1.04 in (9.5 x 4.0 x 2.65 cm) |
|-------------------|---------------------------------------------|



### Technical Specifications

|                                    |                                                        |                                                                                                                                                                                      |                                      |  |
|------------------------------------|--------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|--|
| HP 45W Smart AC Adapter            | Weight                                                 | 0.386 lb (175g) max                                                                                                                                                                  |                                      |  |
|                                    | Input                                                  | 90 to 265 VAC                                                                                                                                                                        |                                      |  |
|                                    | Output                                                 | Input Efficiency                                                                                                                                                                     | 87.74% at 115Vac and 88.4% at 230Vac |  |
|                                    |                                                        | Input frequency range                                                                                                                                                                | 47 to 63 Hz                          |  |
|                                    |                                                        | Input AC current                                                                                                                                                                     | 1.4 A at 90 VAC                      |  |
|                                    |                                                        | Output power                                                                                                                                                                         | 45W                                  |  |
|                                    |                                                        | DC output                                                                                                                                                                            | 19.5V                                |  |
|                                    |                                                        | Hold-up time                                                                                                                                                                         | 5 msec at 115 VAC input              |  |
|                                    |                                                        | Output current limit                                                                                                                                                                 | <8.0A                                |  |
|                                    |                                                        | Over voltage protection                                                                                                                                                              | < 29V max automatic shutdown         |  |
|                                    | Connector                                              | Over short protection                                                                                                                                                                | Auto-recovery and no damage          |  |
|                                    |                                                        | 3 pin/grounded, mates with interchangeable cords                                                                                                                                     |                                      |  |
|                                    | Environmental Design                                   | Operating temperature                                                                                                                                                                | 32° to 95° F (0° to 35° C)           |  |
|                                    |                                                        | Non-operating (storage) temperature                                                                                                                                                  | -4° to 185° F (-20° to 85° C)        |  |
|                                    |                                                        | Altitude                                                                                                                                                                             | 0 to 16,400 ft (0 to 5,000 m)        |  |
|                                    |                                                        | Humidity                                                                                                                                                                             | 20% to 95%                           |  |
|                                    | EMI and Safety Certifications                          | Storage Humidity                                                                                                                                                                     | 10% to 95%                           |  |
|                                    |                                                        | *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. |                                                                                                                                                                                      |                                      |  |
|                                    |                                                        |                                                                                                                                                                                      |                                      |  |
| HP 4-cell, Long Life 44 WHr Li-ion |                                                        |                                                                                                                                                                                      |                                      |  |
|                                    | Dimensions (H x W x L)                                 | 33.40*275.80*20.60 mm (1.32x10.86x0.81 inch)                                                                                                                                         |                                      |  |
|                                    | Weight                                                 | 0.3 kg (0.66lb)                                                                                                                                                                      |                                      |  |
|                                    | Cells/Type                                             | 4cell Lithium-Ion                                                                                                                                                                    |                                      |  |
|                                    | Energy                                                 | Voltage                                                                                                                                                                              | 14.8V                                |  |
|                                    |                                                        | Amp-hour capacity                                                                                                                                                                    | 3.0Ah                                |  |
|                                    |                                                        | Watt-hour capacity                                                                                                                                                                   | 44Wh                                 |  |
|                                    | Temperature                                            | Operating (Charging)                                                                                                                                                                 | 32° to 113° F (0° to 45° C)          |  |
|                                    |                                                        | Operating (Discharging)                                                                                                                                                              | 14° to 122° F(-10° to 60° C)         |  |
|                                    |                                                        | Non-operating                                                                                                                                                                        | -4° to 122° F (-20° to 60° C)        |  |



### Technical Specifications

|                                          |                                      |          |
|------------------------------------------|--------------------------------------|----------|
| <b>Battery Re-Charge Time</b>            | <b>System in OFF or Standby Mode</b> | <3 hours |
| <b>Fuel Gauge LED</b>                    | No                                   |          |
| <b>Warranty</b>                          | 1 year                               |          |
| <b>Optional Travel Battery Available</b> | No                                   |          |

|                                           |                                          |                                                                                              |                                                                                       |
|-------------------------------------------|------------------------------------------|----------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| <b>HP 6-cell, Long Life 55 WHr Li-ion</b> | <b>Dimensions (H x W x L)</b>            | 45.59x275.8x33.89                                                                            |                                                                                       |
|                                           | <b>Weight</b>                            | 330g                                                                                         |                                                                                       |
|                                           | <b>Cells/Type</b>                        | Cylindrical ICR18650 C4                                                                      |                                                                                       |
|                                           | <b>Energy</b>                            | 10.68V                                                                                       | <b>Voltage</b>                                                                        |
|                                           |                                          | 5.15Ah                                                                                       | <b>Amp-hour capacity</b>                                                              |
|                                           |                                          | 55Wh                                                                                         | <b>Watt-hour capacity</b>                                                             |
|                                           | <b>Temperature</b>                       | 32° to 113° F (0° to 45° C)<br>14 to 140° F (-10° to 60° C)<br>-4° to 140° F (-20° to 60° C) | <b>Operating (Charging)</b><br><b>Operating (Discharging)</b><br><b>Non-operating</b> |
|                                           | <b>Battery Re-Charge Time</b>            | 3 hours<br>3 to 5 hours                                                                      | <b>System in OFF or Standby Mode</b><br><b>System ON</b>                              |
|                                           | <b>Fuel Gauge LED</b>                    | NA                                                                                           |                                                                                       |
|                                           | <b>Warranty</b>                          | 3years or 1000 cycles                                                                        |                                                                                       |
|                                           | <b>Optional Travel Battery Available</b> | NO                                                                                           |                                                                                       |

### ENVIRONMENTAL

TBD

### COUNTRY OF ORIGIN

China



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

| Type                | Description                                  | Part number |
|---------------------|----------------------------------------------|-------------|
| <b>Cases</b>        | HP Essential Top Load Case                   | H2W17AA     |
|                     | HP Essential Backpack (up to 15.6")          | H1D24AA     |
|                     | HP Essential Messenger Case (up to 17.3")    | H1D25AA     |
|                     | HP Business Backpack (up to 17.3")           | H5M90AA     |
|                     | HP Business Case(up to 15.6")                | H5M92AA     |
| <b>Docking</b>      | HP 3001pr USB 3 Port Replicator              | F3S42AA     |
|                     | HP 3005pr USB 3.0 Port Replicator            | H1L08AA     |
|                     | HP Display and Notebook Stand                | E8G00AA     |
| <b>Input/Output</b> | HP Stylish Wireless Keyboard and Mouse       | H4B79AA     |
|                     | HP 2.4 GHz Keyboard and Mouse                | G1K29AA     |
|                     | HP Ultra Mobile Wireless Mouse               | H6F25AA     |
|                     | HP X4000b Bluetooth Mouse                    | H3T50AA     |
|                     | HP 3-Button USB Laser Mouse                  | H4B81AA     |
|                     | HP USB Travel Mouse                          | G1K28AA     |
|                     | HP Ultrathin Wireless Mouse                  | L9V78AA     |
|                     | HP Conferencing Keyboard                     | K8P74AA     |
|                     | HP Speaker Phone                             | K7V16AA     |
|                     | HP Wired Headset                             | K7V17AA     |
|                     | HP HDMI to DVI Adapter                       | F5A28AA     |
|                     | HP Wireless Display Adapter                  | J1V25AA     |
|                     | HP 45W Smart AC Adapter 4.5mm                | H6Y88AA     |
|                     | HP 65W Smart AC Adapter                      | H6Y89AA     |
|                     | HP 65W Slim AC Adapter                       | H6Y82AA     |
| <b>Power</b>        | HP 90W Slim AC Adapter                       | H6Y83AA     |
|                     | HP 90W Slim Combo AC Adapter w/ USB          | H6Y84AA     |
|                     | HP Power Bank                                | N9F71AA     |
| <b>Storage</b>      | HP External USB Optical Drive                | F2B56AA     |
|                     | HP 500GB 7200rpm HDD                         | F3B97AA     |
|                     | HP External Portable USB3.0 HDD              | K6A93AA     |
| <b>Security</b>     | HP UltraSlim Keyed Cable Lock                | H4D73AA     |
|                     | HP USB Smart Card Reader                     | F6V67AA     |
| <b>Displays</b>     | HP ProDisplay P242va 24-inch Monitor         | K7X32AA     |
|                     | HP EliteDisplay E222 21.5-inch Monitor       | M1N96AA     |
|                     | HP EliteDisplay E240 23.8-inch Monitor       | M1N99AA     |
|                     | HP EliteDisplay E240c 23.8-inch Monitor      | M1P00AA     |
|                     | HP EliteDisplay S270c 27-inch Curved Display | K1M38AA     |



### Summary of Changes

| Date of change   | Version History | Description of change                     |
|------------------|-----------------|-------------------------------------------|
| February 1, 2016 | Version 1 to 2  | Added Passed MIL-STD testing and footnote |
| March 3, 2016    | Version 2 to 3  | Battery life                              |
| March 31, 2016   | Version 3 to 4  | TPM Upgrade footnote                      |
| April 11, 2016   | Version 4 to 5  | Updated battery life page 3 and 11        |
|                  |                 |                                           |
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