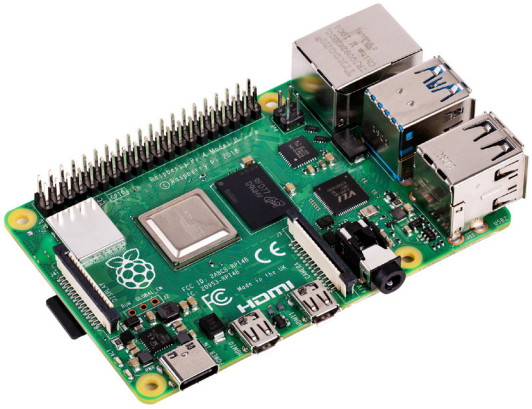
# RASPBERRY PI 4 MODEL B

The Raspberry Pi 4 Model B (Pi4B) is the first of a new generation of Raspberry Pi computers supporting more RAM and with siginficantly enhanced CPU, GPU and I/O performance; all within a similar form factor, power envelope and cost as the previous generation Raspberry Pi 3B+.

The Pi4B is avaiable with either 2, 4 and 8 Gigabytes of LPDDR4 SDRAM.



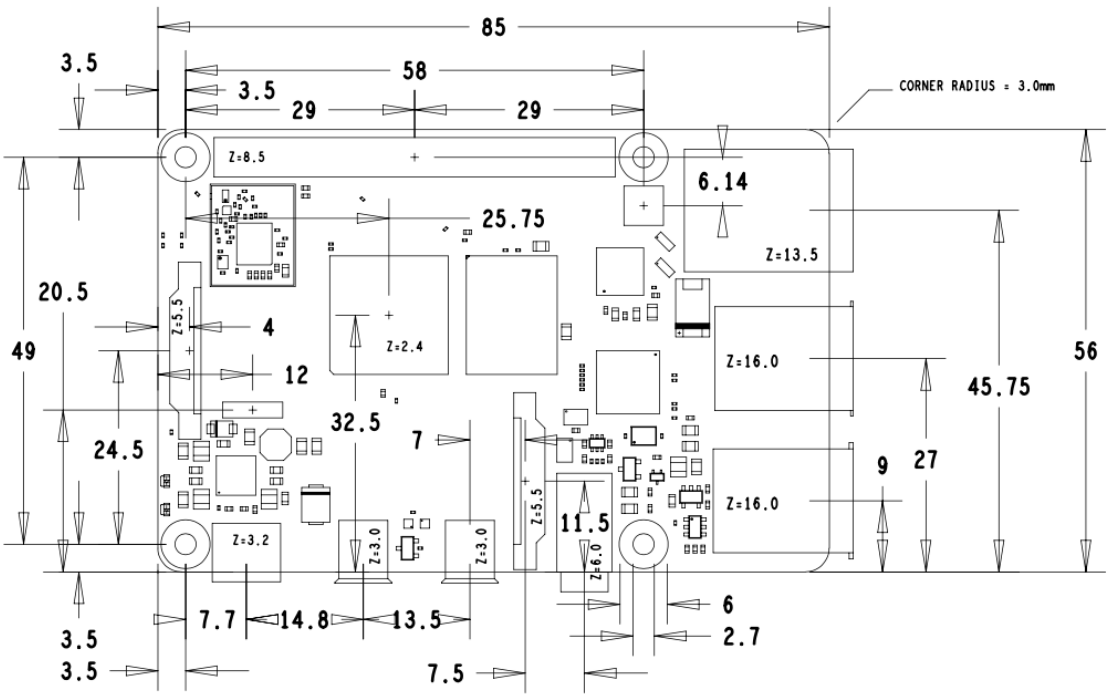
## Specifications

| | | | |
|---|---|---|---|
| **MODEL** | Raspberry Pi 4 Model B | | |
| **HARDWARE** | Quad core 64-bit ARM-Cortex A72 running at 1.5GHz | | |
| | 2,4 and 8 Gigabyte LPDDR4 RAM options | | |
| | H.265 (HEVC) hardware decode (up to 4Kp60) | | |
| | H.264 hardware decode (up to 1080p60) | | |
| | VideoCore VI 3D Graphics | | |
| | Supports dual HDMI display output up to 4Kp60 | | |
| **I/O INTERFACE** | LAN | 802.11 b/g/n/ac Wireless LAN | |
| | Bluetooth | Bluetooth 5.0 with BLE | |
| | SD Card | 1 x SD Card | |
| | HDMI | 2 x micro-HDMI ports supporting dual displays up to 4Kp60 resolution | |
| | USB | 2 x USB 2.0 ports | 2 x USB 3.0 ports |
| | Ethernet | 1 x Gigabit Ethernet port (supports PoE with add-on PoE HAT) | |
| | 1 x Raspberry Pi camera port (2-lane MIPI CSI) | | |
| | 1x Raspberry Pi display port (2-lane MIPI DSI) | | |
| | GPIO | 28 x user GPIO supporting various interface options: | Up to 6 x UART |
| | | | Up to 6 x I2C |
| | | | Up to 5 x SPI |
| | | | 1 x SDIO interface |
| | | | 1 x DPI (Parallel RGB Display) |
| | | | 1 x PCM |
| | | | Up to 2 x PWM channels |
| | | | Up to 3 x GPCLK outputs |

| | | |
|---|---|---|
| SOFTWARE | ARMv8 Instruction Set | |
| | Mature Linux software stack | |
| | Actively developed and maintained | Recent Linux kernel support |
| | | Many drivers upstreamed |
| | | Stable and well supported userland |
| | | Availability of GPU functions using standard APIs |

## Mechanical Specification

Unit:mm




## Electrical Specification

**Caution!** Stresses above those listed in this table may cause permanent damage to the device. This is a stress rating only; functional operation of the device under these or any other conditions above those listed in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

### Absolute Maximum Ratings Table:

| Symbol | Parameter | Minimum | Maximum | Unit |
|---|---|---|---|---|
| VIN | 5V Input Voltage | -0.5 | 6.0 | V |

### Power Requirements:

The Pi4B requires a good quality USB-C power supply capable of delivering 5V at 3A. If attached downstream USB devices consume less than 500mA, a 5V, 2.5A supply may be used.

## DC Characteristics Table:

Please note that VDD IO is the GPIO bank voltage which is tied to the on-board 3.3V supply rail.

| Symbol | Parameter | Conditions | Minimum | Typical | Maximum | Unit |
|---|---|---|---|---|---|---|
| $V_{IL}$ | Input low voltage[a] | VDD_IO = 3.3V | - | - | TBD | V |
| $V_{IH}$ | Input high voltage[a] | VDD_IO = 3.3V | TBD | - | - | V |
| $I_{IL}$ | Input leakage current | TA = +85°C | - | - | TBD | µA |
| $C_{IN}$ | Input capacitance | - | - | TBD | - | pF |
| $V_{OL}$ | Output low voltage[b] | VDD_IO = 3.3V, IOL = -2mA | - | - | TBD | V |
| $V_{OH}$ | Output high voltage[b] | VDD_IO = 3.3V, IOH = 2mA | TBD | - | - | V |
| $I_{OL}$ | Output low current[c] | VDD_IO = 3.3V, VO = 0.4V | TBD | - | - | mA |
| $I_{OH}$ | Output high current[c] | VDD_IO = 3.3V, VO = 2.3V | TBD | - | - | mA |
| $R_{PU}$ | Pullup resistor | - | TBD | - | TBD | kΩ |
| $R_{PD}$ | Pulldown resistor | - | TBD | - | TBD | kΩ |

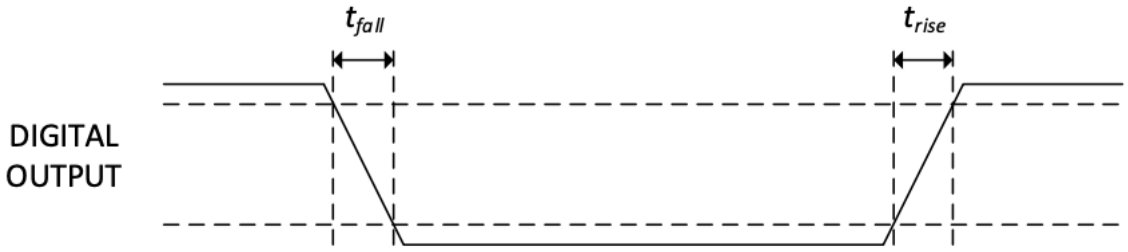
[a] Hysteresis enabled
[b] Default drive strength (8mA)
[c] Maximum drive strength (16mA)

## Digital I/O Pin AC Characteristics Table:

| Pin Name | Symbol | Parameter | Minimum | Typical | Maximum | Unit |
|---|---|---|---|---|---|---|
| Digital outputs | $t_{rise}$ | 10-90% rise time[a] | - | TBD | - | ns |
| Digital outputs | $t_{fall}$ | 90-10% fall time[a] | - | TBD | - | ns |

[a] Default drive strength, CL = 5pF, VDD_IO = 3.3V

## Digital IO Characteristics:



# Peripherals

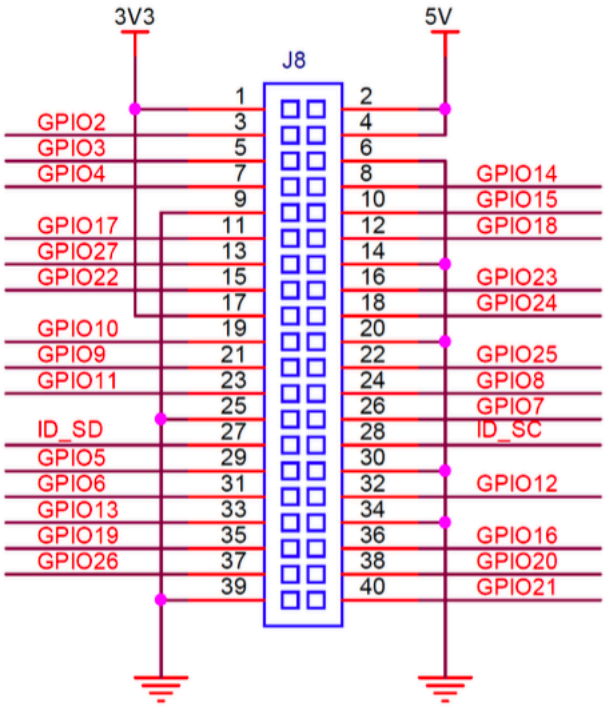
## GPIO Interface:

The Pi4B makes 28 BCM2711 GPIOs available via a standard Raspberry Pi 40-pin header. This header is backwards compatible with all previous Raspberry Pi boards with a 40-way header.

## GPIO Pin Assignments:

As well as being able to be used as straightforward software controlled input and output (with pro- grammable pulls), GPIO pins can be switched (multiplexed) into various other modes backed by dedi- cated peripheral blocks such as I2C, UART and SPI.

In addition to the standard peripheral options found on legacy Pis, extra I2C, UART and SPI peripherals have been added to the BCM2711 chip and are available as further mux options on the Pi4. This gives users much more flexibility when attaching add-on hardware as compared to older models.




**ID_SD and ID_SC PINS:**

These pins are reserved for HAT ID EEPROM.

At boot time this I2C interface will be interrogated to look for an EEPROM that identifes the attached board and allows automagic setup of the GPIOs (and optionally, Linux drivers).

***DO NOT USE these pins for anything other than attaching an I2C ID EEPROM. Leave unconnected if ID EEPROM not required.***

## GPIO Alternate Functions:

Table details the default pin pull state and available alternate GPIO functions. Most of these alternate peripheral functions are described in detail in the BCM2711 Peripherals Specification document which can be downloaded from the hardware documentation section of the website.

| GPIO | Default Pull | ALT0 | ALT1 | ALT2 | ALT3 | ALT4 | ALT5 |
|---|---|---|---|---|---|---|---|
| 0 | High | SDA0 | SA5 | PCLK | SPI3_CE0_N | TXD2 | SDA6 |
| 1 | High | SCL0 | SA4 | DE | SPI3_MISO | RXD2 | SCL6 |
| 2 | High | SDA1 | SA3 | LCD_VSYNC | SPI3_MOSI | CTS2 | SDA3 |
| 3 | High | SCL1 | SA2 | LCD_HSYNC | SPI3_SCLK | RTS2 | SCL3 |
| 4 | High | GPCLK0 | SA1 | DPI_D0 | SPI4_CE0_N | TXD3 | SDA3 |
| 5 | High | GPCLK1 | SA0 | DPI_D1 | SPI4_MISO | RXD3 | SCL3 |
| 6 | High | GPCLK2 | SOE_N | DPI_D2 | SPI4_MOSI | CTS3 | SDA4 |
| 7 | High | SPI0_CE1_N | SWE_N | DPI_D3 | SPI4_SCLK | RTS3 | SCL4 |
| 8 | High | SPI0_CE0_N | SD0 | DPI_D4 | - | TXD4 | SDA4 |
| 9 | Low | SPI0_MISO | SD1 | DPI_D5 | - | RXD4 | SCL4 |
| 10 | Low | SPI0_MOSI | SD2 | DPI_D6 | - | CTS4 | SDA5 |
| 11 | Low | SPI0_SCLK | SD3 | DPI_D7 | - | RTS4 | SCL5 |
| 12 | Low | PWM0 | SD4 | DPI_D8 | SPI5_CE0_N | TXD5 | SDA5 |
| 13 | Low | PWM1 | SD5 | DPI_D9 | SPI5_MISO | RXD5 | SCL5 |
| 14 | Low | TXD0 | SD6 | DPI_D10 | SPI5_MOSI | CTS5 | TXD1 |
| 15 | Low | RXD0 | SD7 | DPI_D11 | SPI5_SCLK | RTS5 | RXD1 |
| 16 | Low | FL0 | SD8 | DPI_D12 | CTS0 | SPI1_CE2_N | CTS1 |
| 17 | Low | FL1 | SD9 | DPI_D13 | RTS0 | SPI1_CE1_N | RTS1 |
| 18 | Low | PCM_CLK | SD10 | DPI_D14 | SPI6_CE0_N | SPI1_CE0_N | PWM0 |
| 19 | Low | PCM_FS | SD11 | DPI_D15 | SPI6_MISO | SPI1_MISO | PWM1 |
| 20 | Low | PCM_DIN | SD12 | DPI_D16 | SPI6_MOSI | SPI1_MOSI | GPCLK0 |
| 21 | Low | PCM_DOUT | SD13 | DPI_D17 | SPI6_SCLK | SPI1_SCLK | GPCLK1 |
| 22 | Low | SD0_CLK | SD14 | DPI_D18 | SD1_CLK | ARM_TRST | SDA6 |
| 23 | Low | SD0_CMD | SD15 | DPI_D19 | SD1_CMD | ARM_RTCK | SCL6 |
| 24 | Low | SD0_DAT0 | SD16 | DPI_D20 | SD1_DAT0 | ARM_TDO | SPI3_CE1_N |
| 25 | Low | SD0_DAT1 | SD17 | DPI_D21 | SD1_DAT1 | ARM_TCK | SPI4_CE1_N |
| 26 | Low | SD0_DAT2 | TE0 | DPI_D22 | SD1_DAT2 | ARM_TDI | SPI5_CE1_N |
| 27 | Low | SD0_DAT3 | TE1 | DPI_D23 | SD1_DAT3 | ARM_TMS | SPI6_CE1_N |

## Display Parallel Interface (DPI)

A standard parallel RGB (DPI) interface is available the GPIOs. This up-to-24-bit parallel interface can support a secondary display.

### SD/SDIO Interface

The Pi4B has a dedicated SD card socket which suports 1.8V, DDR50 mode (at a peak bandwidth of 50 Megabytes / sec). In addition, a legacy SDIO interface is available on the GPIO pins.

### SD/SDIO Interface

The Pi4B has 1x Raspberry Pi 2-lane MIPI CSI Camera and 1x Raspberry Pi 2-lane MIPI DSI Display connector. These connectors are backwards compatible with legacy Raspberry Pi boards, and support all of the available Raspberry Pi camera and display peripherals.

### USB

The Pi4B has 2x USB2 and 2x USB3 type-A sockets. Downstream USB current is limited to approximately 1.1A in aggregate over the four sockets.

### HDMI

The Pi4B has 2x micro-HDMI ports, both of which support CEC and HDMI 2.0 with resolutions up to 4Kp60.

### Audio and Composite (TV Out)

The Pi4B supports near-CD-quality analogue audio output and composite TV-output via a 4-ring TRS 'A/V' jack.

The analog audio output can drive 32 Ohm headphones directly.

### Temperature Range and Thermals

The recommended ambient operating temperature range is 0 to 50 degrees Celcius.

To reduce thermal output when idling or under light load, the Pi4B reduces the CPU clock speed and voltage. During heavier load the speed and voltage (and hence thermal output) are increased. The internal governor will throttle back both the CPU speed and voltage to make sure the CPU temperature never exceeds 85 degrees C.

The Pi4B will operate perfectly well without any extra cooling and is designed for sprint performance - expecting a light use case on average and ramping up the CPU speed when needed (e.g. when loading a webpage). If a user wishes to load the system continually or operate it at a high termperature at full performance, further cooling may be needed.

## Packing List

| Deafult Items | Qty |
|---|---|
| RASPBERRY Pi 4 Model B Unit | 1 |