DATASHEET

Raspberry Pi 4 Model B

Release 1

June 2019

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Table 1: Release History

Release Date Description

1 21/06/2019 First release

The latest release of this document can be found at https://www.raspberrypi.org 1 Release 1

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1 Introduction

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 1, 2 and 4 Gigabytes of LPDDR4 SDRAM.

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2 Features

2.1 Hardware

*•* Quad core 64-bit ARM-Cortex A72 running at 1.5GHz

*•* 1, 2 and 4 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

2.2 Interfaces

*•* 802.11 b/g/n/ac Wireless LAN

*•* Bluetooth 5.0 with BLE

*•* 1x SD Card

*•* 2x micro-HDMI ports supporting dual displays up to 4Kp60 resolution

*•* 2x USB2 ports

*•* 2x USB3 ports

*•* 1x Gigabit Ethernet port (supports PoE with add-on PoE HAT)

*•* 1x Raspberry Pi camera port (2-lane MIPI CSI)

*•* 1x Raspberry Pi display port (2-lane MIPI DSI)

*•* 28x user GPIO supporting various interface options:

– Up to 6x UART

– Up to 6x I2C

– Up to 5x SPI

– 1x SDIO interface

– 1x DPI (Parallel RGB Display)

– 1x PCM

– Up to 2x PWM channels

– Up to 3x GPCLK outputs

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2.3 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

3 Mechanical Specification

Figure 1: Mechanical Dimensions

4 Electrical Specification

Caution! Stresses above those listed in Table 2 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.

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Symbol Parameter Minimum Maximum Unit

VIN 5V Input Voltage -0.5 6.0 V

Table 2: Absolute Maximum Ratings

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 *VIL* Input low voltage*a* VDD IO = 3.3V - - TBD V *VIH* Input high voltage*a* VDD IO = 3.3V TBD - - V *IIL* Input leakage current TA = +85*◦*C - - TBD *µ*A *CIN* Input capacitance - - TBD - pF *VOL* Output low voltage*b* VDD IO = 3.3V, IOL = -2mA - - TBD V *VOH* Output high voltage*b* VDD IO = 3.3V, IOH = 2mA TBD - - V *IOL* Output low current*c* VDD IO = 3.3V, VO = 0.4V TBD - - mA *IOH* Output high current*c* VDD IO = 3.3V, VO = 2.3V TBD - - mA *RP U* Pullup resistor - TBD - TBD kΩ *RP D* Pulldown resistor - TBD - TBD kΩ *a* Hysteresis enabled

*b* Default drive strength (8mA)

*c* Maximum drive strength (16mA)

Table 3: DC Characteristics

Pin Name Symbol Parameter Minimum Typical Maximum Unit Digital outputs *trise* 10-90% rise time*a*- TBD - ns Digital outputs *tfall* 90-10% fall time*a*- TBD - ns *a* Default drive strength, CL = 5pF, VDD IO = 3.3V

Table 4: Digital I/O Pin AC Characteristics

*tfall trise*

DIGITAL

OUTPUT

Figure 2: Digital IO Characteristics

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4.1 Power Requirements

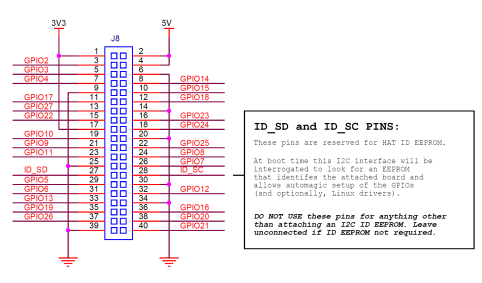
The Pi4B requires a good quality USB-C power supply capable of delivering 5V at 3A. If attached downstream USB devices consume less than 500mA, a 5V, 2.5A supply may be used.

5 Peripherals

5.1 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.

5.1.1 GPIO Pin Assignments

Figure 3: GPIO Connector Pinout

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.

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5.1.2 GPIO Alternate Functions

Default

GPIO 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

Table 5: Raspberry Pi 4 GPIO Alternate Functions

Table 5 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.

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5.1.3 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.

5.1.4 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.

5.2 Camera and Display Interfaces

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.

5.3 USB

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

5.4 HDMI

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

5.5 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.

5.6 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.

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6 Availability

Raspberry Pi guarantee availability Pi4B until at least January 2026.

7 Support

For support please see the hardware documentation section of the Raspberry Pi website and post ques tions to the Raspberry Pi forum.

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