Raspberry Pi Compute Module 5 forward guidance

Raspberry Pi Ltd

2024-03-22: githash: e844c57-clean

Colophon

2020-2023 Raspberry Pi Ltd (formerly Raspberry Pi (Trading) Ltd.)

> ℹ️ **NOTE**
>
> This whitepaper is restricted and covered by the Raspberry Pi Ltd non-disclosure agreement (NDA). It should not be copied, shared, or duplicated without permission.

build-date: 2024-03-22
build-version: githash: e844c57-clean

Legal disclaimer notice

TECHNICAL AND RELIABILITY DATA FOR RASPBERRY PI PRODUCTS (INCLUDING DATASHEETS) AS MODIFIED FROM TIME TO TIME ("RESOURCES") ARE PROVIDED BY RASPBERRY PI LTD ("RPL") "AS IS" AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. TO THE MAXIMUM EXTENT PERMITTED BY APPLICABLE LAW IN NO EVENT SHALL RPL BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THE RESOURCES, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

RPL reserves the right to make any enhancements, improvements, corrections or any other modifications to the RESOURCES or any products described in them at any time and without further notice.

The RESOURCES are intended for skilled users with suitable levels of design knowledge. Users are solely responsible for their selection and use of the RESOURCES and any application of the products described in them. User agrees to indemnify and hold RPL harmless against all liabilities, costs, damages or other losses arising out of their use of the RESOURCES.

RPL grants users permission to use the RESOURCES solely in conjunction with the Raspberry Pi products. All other use of the RESOURCES is prohibited. No licence is granted to any other RPL or other third party intellectual property right.

HIGH RISK ACTIVITIES. Raspberry Pi products are not designed, manufactured or intended for use in hazardous environments requiring fail safe performance, such as in the operation of nuclear facilities, aircraft navigation or communication systems, air traffic control, weapons systems or safety-critical applications (including life support systems and other medical devices), in which the failure of the products could lead directly to death, personal injury or severe physical or environmental damage ("High Risk Activities"). RPL specifically disclaims any express or implied warranty of fitness for High Risk Activities and accepts no liability for use or inclusions of Raspberry Pi products in High Risk Activities.

Raspberry Pi products are provided subject to RPL's Standard Terms. RPL's provision of the RESOURCES does not expand or otherwise modify RPL's Standard Terms including but not limited to the disclaimers and warranties expressed in them.

Document version history

> **ⓘ NOTE**
>
> This is a draft document, and is not yet finalised. It is intended to be technically complete, but it has not yet been edited. If you notice any issues, please let us know by email to applications@raspberrypi.com so that we can improve it for you and other customers.

Release	Date	Description
1.0	1 Nov 2023	• Initial release
1.1	19 Mar 2024	• Fix pinout table for swapped information on pins 104/106; added information on extra USB 3 ports; removed connectors section.

Scope of document

This document applies to the following Raspberry Pi products:

Pi Zero			Pi 1				Pi 2		Pi 3			Pi 4	Pi 5	Pi 400	CM1	CM3	CM4	CM5	Pico
Zero	W	H	A	B	A+	B+	A	B	B	A+	B+	All	All	All	All	All	All	All	All
																		*	

Introduction

Raspberry Pi Compute Module 5 builds on the Raspberry Pi tradition of taking the latest main-line Raspberry Pi computers and producing a small product suitable for embedded applications. At the time of writing, the Raspberry Pi Compute Module 5 is under development, and **currently** follows the same compact form factor as the Raspberry Pi Compute Module 4 but provides higher performance and an improved feature set. There are, of course, some differences between Raspberry Pi Compute Module 4 and Raspberry Pi Compute Module 5. These are described here.

> **ⓘ NOTE**
>
> For the few customers who are unable to use the Raspberry Pi Compute Module 5, the Raspberry Pi Compute Module 4 will stay in production till at least 2031.

The information below is still subject to change, and will not be confirmed until the launch of the Raspberry Pi Compute Module 5.

Main features

The Raspberry Pi Compute Module 5 will have the following features.

- 4× A76 clocked @ 2GHz
- Maximum 16GB LPDDR4× SDRAM [1]
- Onboard eMMC options [2]
- 2× USB 3.0 ports
- 1Gbit Ethernet interface
- 2× 4-lane DSI/CSI ports
- 2× HDMI ports capable of 4Kp60
- 28× GPIO pins
- Onboard test points to simplify production programming
- Internal EEPROM on the bottom to improve security
- Onboard RTC (external battery via 100pin connectors)
- Onboard fan controller
- Onboard Wi-Fi/Bluetooth
- 1 lane PCIe 2.0. [3]
- Type C PD PSU support

[1] Exact options are yet to be decided. 1GB, 2GB, 4GB, 8GB and 16GB are likely to be available.
[2] Exact options are yet to be decided. 8GB, 16GB and 32GB are likely to be available.
[3] In some applications PCI Gen 3 is possible, but this is not officially supported.

> ℹ **NOTE**
>
> Not all SDRAM/eMMC configurations will be available.

Raspberry Pi Compute Module 4 compatibility

For most customers, the Raspberry Pi Compute Module 5 will be pin-compatible with the Raspberry Pi Compute Module 4.

The following features have been removed from the Raspberry Pi Compute Module 5 when compared to the Raspberry Pi Compute Module 4:

- Composite video
- 2 lane DSI port
- 2 lane CSI port
- 2× ADC inputs

Detailed pinout changes

CAM1 signals become dual-purpose and can be used for either a CSI camera or a DSI display.

DSI1 signals become dual-purpose and can be used for either a CSI camera or a DSI display.

The Raspberry Pi Compute Module 4 has extra ESD protection on the HDMI, SDA, SCL, HPD and CEC signals. This is removed from the Raspberry Pi Compute Module 5.

What was CAM0 on the Compute Module 4 now supports a USB 3.0 Port. What was DSI0 now supports a USB 3.0 port. The original Compute Module 4 VDAC_COMP pin is now a VBUS enable pin for the two USB 3 ports and is active high.

Pin	CM4	CM5	Comment
16	SYNC_IN	Fan_tacho	Fan tacho input
19	Ethernet nLED1	Fan_pwn	Fan PWM output
76	Reserved	VBAT	RTC battery. Note, there will be a constant load of a few uA even if the CM5 is powered.
92	RUN_PG	PWR_Button	Replicates the power button on Raspberry Pi 5. A short press signals that the device should wake up or shut down. A long press forces shutdown.
93	nRPIBOOT	nRPIBOOT	For a short time after power-up, if the PWR_button is low this pin will also be set low.
94	AnalogIP1	CC1	This pin can connect to the CC1 line of a Type C USB connector to enable the PMIC to negotiate 5A.
96	AnalogIP0	CC2	This pin can connect to the CC2 line of a Type C USB connector to enable the PMIC to negotiate 5A.
97	Camera_GPIO	CD0_IO_MICCLK	Can be a GPIO or part of the bus with pin 100.
99	Global_EN	PMIC_ENABLE	No external change.
100	nEXTRST	CD0_IO_MICDATA	Pulled up on Raspberry Pi Compute Module 5, but can be forced low to emulate a RESET signal.
104	Reserved	PCIE_DET_nWAKE	PCIE nWAKE. Pull up to CM5_3v3 with an 8.2K resistor.
106	Reserved	PCIE_PWR_EN	Signals if the PCIe device can be powered up or down. Active high.
111	VDAC_COMP	VBUS_EN	Output to signal USB VBUS should be enabled.

Pin	CM4	CM5	Comment
128	CAM0_D0_N	USB3-0-RX_N	May be P/N swapped.
130	CAM0_D0_P	USB3-0-RX_P	May be P/N swapped.
134	CAM0_D1_N	USB3-0-DP	USB 2 signal.
136	CAM0_D1_P	USB3-0-DM	USB 2 signal.
140	CAM0_C_N	USB3-0-TX_N	May be P/N swapped.
142	CAM0_C_P	USB3-0-TX_P	May be P/N swapped.
157	DSI0_D0_N	USB3-1-RX_N	May be P/N swapped.
159	DSI0_D0_P	USB3-1-RX_P	May be P/N swapped.
163	DSI0_D1_N	USB3-1-DP	USB 2 signal.
165	DSI0_D1_P	USB3-1-DM	USB 2 signal.
169	DSI0_C_N	USB3-1-TX_N	May be P/N swapped.
171	DSI0_C_P	USB3-1-TX_P	May be P/N swapped.

In addition to the above, the PCIe CLK signals are no longer capacitively coupled.

The PCB is likely to be thicker, and will probably measure 1.24mm+/-10%

Track lengths

HDMI0 track lengths have changed. Each P/N pair remains matched, but the skew between pairs is now <1mm for existing motherboards. This is unlikely to make a difference as the skew between pairs can be in the order of 25mm.

HDMI1 track lengths have also changed. Each P/N pair remains matched, but the skew between pairs is now <5mm for existing motherboards. This is unlikely to make a difference as the skew between pairs can be in the order of 25mm.

Ethernet track lengths have changed. Each P/N pair remains matched, but the skew between pairs is now <4mm for existing motherboards. This is unlike to make a difference as the skew between pairs can be in the order of 12mm.

Power budget

As the Raspberry Pi Compute Module 5 is significantly more powerful than the Raspberry Pi Compute Module 4, it will consume more power. Power supply designs should budget for 5V up to 2.5A. If this creates an issue with an existing motherboard design, it is possible to reduce the CPU clock rate to reduce the peak power consumption.

Contact Details for more information

Please contact applications@raspberrypi.com if you have any queries about this information.

Web: www.raspberrypi.com

Raspberry Pi

Raspberry Pi is a trademark of Raspberry Pi Ltd