



Transitioning from Compute Module 4 to Compute Module 5

Colophon

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Document version history

Release	Date	Description
1	Mar 2025	Initial release. This document is heavily based on the 'Raspberry Pi Compute Module 5 forward guidance' whitepaper.

Scope of document

This document applies to the following Raspberry Pi products:

Pi 0			Pi 1		Pi 2		Pi 3	Pi 4	Pi 400	Pi 5	Pi 500	CM1	CM3	CM4	CM5	Pico	Pico2
0	W	H	A	B	A	B	B	All	All	All	All	All	All	All	All	All	All
														✓	✓		

Introduction

Raspberry Pi Compute Module 5 continues the Raspberry Pi tradition of taking the latest flagship Raspberry Pi computer and producing a small, hardware-equivalent product suitable for embedded applications. Raspberry Pi Compute Module 5 has the same compact form factor as 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, and these are described in this document.

 NOTE

For the few customers who are unable to use Raspberry Pi Compute Module 5, Raspberry Pi Compute Module 4 will stay in production until at least 2034.

The Raspberry Pi Compute Module 5 datasheet should be read in conjunction with this whitepaper. <https://datasheets.raspberrypi.com/cm5/cm5-datasheet.pdf>.

Main features

Raspberry Pi Compute Module 5 has the following features:

- Quad-core 64-bit Arm Cortex-A76 (Armv8) SoC clocked @ 2.4GHz
- 2GB, 4GB, 8GB, or 16GB LPDDR4x SDRAM
- On-board eMMC flash memory; 0GB (Lite model), 16GB, 32GB, or 64GB options
- 2x USB 3.0 ports
- 1 Gb Ethernet interface
- 2x 4-lane MIPI ports supporting both DSI and CSI-2
- 2x HDMI® ports able to support 4Kp60 simultaneously
- 28x GPIO pins
- On-board test points to simplify production programming
- Internal EEPROM on the bottom to improve security
- On-board RTC (external battery via 100-pin connectors)
- On-board fan controller
- On-board Wi-Fi®/Bluetooth (depending on SKU)
- 1-lane PCIe 2.0 ¹
- Type-C PD PSU support

NOTE

Not all SDRAM/eMMC configurations are available. Please check with our sales team.

¹ In some applications PCIe Gen 3.0 is possible, but this is not officially supported.

Raspberry Pi Compute Module 4 compatibility

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

The following features have been removed/alterd between the Raspberry Pi Compute Module 5 and Raspberry Pi Compute Module 4 models:

- Composite video
 - The composite output available on Raspberry Pi 5 is NOT routed out on Raspberry Pi Compute Module 5
- 2-lane DSI port
 - There are two 4-lane DSI ports available on Raspberry Pi Compute Module 5, muxed with the CSI ports for a total of two
- 2-lane CSI port
 - There are two 4-lane CSI ports available on Raspberry Pi Compute Module 5, muxed with the DSI ports for a total of two
- 2x ADC inputs

Memory

Raspberry Pi Compute Module 4's maximum memory capacity is 8GB, whereas Raspberry Pi Compute Module 5 is available in a 16GB RAM variant.

Unlike Raspberry Pi Compute Module 4, Raspberry Pi Compute Module 5 is NOT available in a 1GB RAM variant.

Analogue audio

Analogue audio can be muxed onto GPIO pins 12 and 13 on Raspberry Pi Compute Module 5, in the same way as on Raspberry Pi Compute Module 4.

Use the following device tree overlay to assign analogue audio to these pins:

```
dtoverlay=audremap
# or
dtoverlay=audremap,pins_12_13
```

Due to an errata on the RP1 chip, GPIO pins 18 and 19, which could be used for analogue audio on Raspberry Pi Compute Module 4, are not connected to the analogue audio hardware on Raspberry Pi Compute Module 5 and cannot be used.

NOTE

The output is a bitstream rather than a genuine analogue signal. Smoothing capacitors and an amplifier will be needed on the IO board to drive a line-level output.

Changes to USB boot

USB booting from a flash drive is only supported via the USB 3.0 ports on pins 134/136 and 163/165.

Raspberry Pi Compute Module 5 does NOT support USB host boot on the USB-C port.

Unlike the BCM2711 processor, the BCM2712 does not have an xHCI controller on the USB-C interface, just a DWC2 controller on pins 103/105. Booting using `RPI_BOOT` is done via these pins.

Change to module reset and power-down mode

I/O pin 92 is now set to `PWR_Button` rather than `RUN_PG` — this means you need to use a `PMIC_EN` to reset the module.

The `PMIC_ENABLE` signal resets the PMIC, and therefore the SoC. You can view `PMIC_EN` when it's driven low and released, which is functionally similar to driving `RUN_PG` low on Raspberry Pi Compute Module 4 and releasing it.

Raspberry Pi Compute Module 4 has the added benefit of being able to reset peripherals via the `nEXTRST` signal. Raspberry Pi Compute Module 5 will emulate this functionality on `CAM_GPIO1`.

`GLOBAL_EN` / `PMIC_EN` are wired directly to the PMIC and bypass the OS completely. On Raspberry Pi Compute Module 5, use `GLOBAL_EN` / `PMIC_EN` to execute a hard (but unsafe) shutdown.

If there is a need, when using an existing IO board, to retain the functionality of toggling I/O pin 92 to start a hard reset, you should intercept the `PWR_Button` at the software level; rather than having it invoke a system shutdown, it can be used to generate a software interrupt and, from there, to trigger a system reset directly (e.g. write to `PM_RSTC`).

Device tree entry handling a power button (arch/arm64/boot/dts/broadcom/bcm2712-rpi-cm5.dtsi):

```
pwr_key: pwr {
    label = "pwr_button";
    // linux,code = <205>; // KEY_SUSPEND
    linux,code = <116>; // KEY_POWER
    gpios = <&gpio 20 GPIO_ACTIVE_LOW>;
    debounce-interval = <50>; // ms
};
```

Code 116 is the standard event code for the kernel's `KEY_POWER` event, and there is a handler for this in the OS.

Raspberry Pi recommends using kernel watchdogs if you are concerned about the firmware or the OS crashing and leaving the power key unresponsive. ARM watchdog support is already present in Raspberry Pi OS via the device tree, and this can be customised to individual use cases. In addition, a long press/pull on the `PWR_Button` (7 seconds) will cause the PMIC's built-in handler to shut down the device.

Detailed pinout changes

CAM1 and DSI1 signals have become dual-purpose and can be used for either a CSI camera or a DSI display.

The pins previously used for CAM0 and DSI0 on Raspberry Pi Compute Module 4 now support a USB 3.0 port on Raspberry Pi Compute Module 5.

The original Raspberry Pi Compute Module 4 `VDAC_COMP` pin is now a VBUS-enabled pin for the two USB 3.0 ports, and is active high.

Raspberry Pi Compute Module 4 has extra ESD protection on the HDMI, SDA, SCL, HPD, and CEC signals. This is removed from Raspberry Pi Compute Module 5 due to space limitations. If required, ESD protection can be applied to the baseboard, although Raspberry Pi Ltd does not regard it as essential.

Pin	CM4	CM5	Comment
16	SYNC_IN	Fan_tacho	Fan tachometer input
19	Ethernet nLED1	Fan_pwm	Fan PWM output
76	Reserved	VBAT	RTC battery. Note: There will be a constant load of a few uA, even if 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	If the PWR_Button is low, this pin will also be set low for a short time after power-up.
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.
99	Global_EN	PMIC_ENABLE	No external change.
100	nEXTRST	CAM_GPIO1	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 whether the PCIe device can be powered up or down. Active high.
111	VDAC_COMP	VBUS_EN	Output to signal that USB VBUS should be enabled.
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 2.0 signal.
136	CAM0_D1_P	USB3-0-DM	USB 2.0 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 2.0 signal.
165	DSI0_D1_P	USB3-1-DM	USB 2.0 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.

PCB

Raspberry Pi Compute Module 5's PCB is thicker than Raspberry Pi Compute Module 4's, measuring at 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 25 mm.

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 25 mm.

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

Connectors

The two 100-pin connectors have been changed to a different brand. These are compatible with the existing connectors but have been tested at high currents. The mating part that goes onto the motherboard is Amphenol P/N 10164227-1001A1RLF.

Power budget

As Raspberry Pi Compute Module 5 is significantly more powerful than Raspberry Pi Compute Module 4, it will consume more electrical 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 lower the peak power consumption.

The firmware monitors the current limit for USB, which effectively means that `usb_max_current_enable` is always 1 on CM5; the IO board design should take the total USB current required into consideration.

The firmware will report the detected power supply capabilities (if possible) via 'device-tree'. On a running system, see `/proc/device-tree/chosen/power/*`. These files are stored as 32-bit big-endian binary data.

Software changes/requirements

From a software point of view, the changes in hardware between Raspberry Pi Compute Module 4 and Raspberry Pi Compute Module 5 are hidden from the user by new device tree files, which means the majority of the software that adheres to the standard Linux APIs will work without change. The device tree files ensure that the correct drivers for the hardware are loaded at boot time.

Device tree files can be found in the Raspberry Pi Linux kernel tree. For example: <https://github.com/raspberrypi/linux/blob/rpi-6.12.y/arch/arm64/boot/dts/broadcom/bcm2712-rpi-cm5.dtsi>.

Users moving to Raspberry Pi Compute Module 5 are advised to use the software versions indicated in the table below, or newer. While there is no requirement to use Raspberry Pi OS, it is a useful reference, hence its inclusion in the table.

Software	Version	Date	Notes
Raspberry Pi OS	Bookworm (12)		
Firmware		From 10 Mar 2025	See https://pip.raspberrypi.com/categories/685-app-notes-guides-whitepapers/documents/RP-003476-WP/Updating-Pi-firmware.pdf for details on upgrading firmware on an existing image. Note that Raspberry Pi Compute Module 5 devices come pre-programmed with appropriate firmware
Kernel	6.12.x	From 2025	This is the kernel used in Raspberry Pi OS

Moving to standard Linux APIs/libraries from proprietary drivers/firmware

All the changes listed below were part of the transition from Raspberry Pi OS Bullseye to Raspberry Pi OS Bookworm in October 2023. While Raspberry Pi Compute Module 4 was able to use the older deprecated APIs (as the required legacy firmware was still present), this is not the case on Raspberry Pi Compute Module 5.

Raspberry Pi Compute Module 5, like Raspberry Pi 5, now relies on the DRM (Direct Rendering Manager) display stack, rather than the legacy stack often referred to as DispmanX. There is NO firmware support on Raspberry Pi Compute Module 5 for DispmanX, so moving to DRM is essential.

A similar requirement applies to cameras; Raspberry Pi Compute Module 5 only supports the `libcamera` library's API, so older applications that use the legacy firmware MMAL APIs, such as `raspi-still` and `raspi-vid`, no longer function.

Applications using the OpenMAX API (cameras, codecs) will no longer work on Raspberry Pi Compute Module 5, so will need to be rewritten to use V4L2. Examples of this can be found in the `libcamera-apps` GitHub repository, where it is used to access the H264 encoder hardware.

OMXPlayer is no longer supported, as it also uses the MMAL API — for video playback, you should use the VLC application. There is no command-line compatibility between these applications: see the VLC documentation for details on usage.

Raspberry Pi previously published a whitepaper that discusses these changes in more detail: <https://pip.raspberrypi.com/categories/685-app-notes-guides-whitepapers/documents/RP-006519-WP/Transitioning-from-Bullseye-to-Bookworm.pdf>.

Additional information

While not strictly related to the transition from Raspberry Pi Compute Module 4 to Raspberry Pi Compute Module 5, Raspberry Pi Ltd has released a new version of the Raspberry Pi Compute Module provisioning software and also has two distro generation tools that users of Raspberry Pi Compute Module 5 may find useful.

`rpi-sb-provisioner` is a minimal-input, automatic secure boot provisioning system for Raspberry Pi devices. It is entirely free to download and use, and can be found on our GitHub page here: <https://github.com/raspberrypi/rpi-sb-provisioner>.

`pi-gen` is the tool used to create the official Raspberry Pi OS images, but it is also available for third parties to use to create their own distributions. This is the recommended approach for Raspberry Pi Compute Module applications that require customers to build a custom Raspberry Pi OS-based operating system for their specific use case. This is also free to download and use, and can be found here: <https://github.com/RPi-Distro/pi-gen>. The `pi-gen` tool integrates well with `rpi-sb-provisioner` to provide an end-to-end process for generating secure boot OS images and implementing them on Raspberry Pi Compute Module 5.

`rpi-image-gen` is a new image creation tool (<https://github.com/raspberrypi/rpi-image-gen>) that may be more appropriate for more lightweight customer distributions.

For bring-up and testing — and where there is no requirement for the full provisioning system — `rpiboot` is still available on Raspberry Pi Compute Module 5. Raspberry Pi Ltd recommends using a host Raspberry Pi SBC running the latest version of Raspberry Pi OS and the latest `rpiboot` from <https://github.com/raspberrypi/usbboot>. You must use the 'Mass Storage Gadget' option when running `rpiboot`, as the previous firmware-based option is no longer supported.

Contact Details for more information

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