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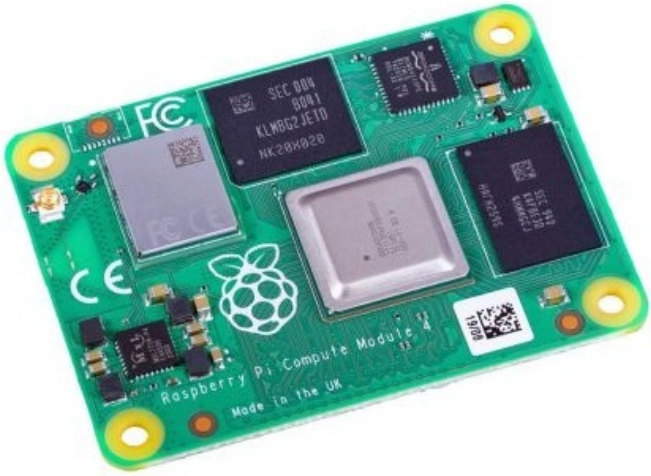
Raspberry Pi

Raspberry Pi 5 Extra PMIC Compute Module 4



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- build-date: 2024-07-09
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Document version history

Release	Date	Description
1.0	16 Dec 2022	• Initial release
1.1	7 Jul 2024	• Fix typo in vc gencmd commands, added Raspberry Pi 5 detail.

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**	**CM 1**	**CM 3**	**CM 4**	**Pico**
Zero	W	H	A	B	A+	B+	A	B	B	A+	B+	All	All	All	All	All	All	All

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Introduction

Raspberry Pi 4/5 and Raspberry Pi Compute Module 4 devices use a Power Management Integrated Circuit (PMIC) to supply the various voltages required by the various components on the PCB. They also sequence power-ups to ensure the devices are started in the correct order. Over the duration of the production of these models, a number of different PMIC devices have been used. All the PMICS have provided extra functionality over and above that of the voltage supply:

- Two ADC channels that can be used on CM4.
- On later revisions of Raspberry Pi 4 and Raspberry Pi 400, and all models of the Raspberry Pi 5, the ADCs are wired up to the USB-C power connector on CC1 and CC2.
- An on-chip sensor that can be used to monitor the PMIC's temperature, available on Raspberry Pi 4 and 5, and CM4.

This document describes how to access these features in the software.

WARNING

There is no guarantee that this functionality will be maintained in future versions of the PMIC, so it should be used with caution.

You may also wish to refer to the following documents:

- Raspberry Pi CM4 datasheet: https://datasheets.raspberrypi.com/cm4/cm4-datasheet.pdf
- Raspberry Pi 4 reduced schematics: https://datasheets.raspberrypi.com/rpi4/raspberry-pi-4-reduced-schematics.pdf

This white paper assumes that the Raspberry Pi is running Raspberry Pi OS, and is fully up to date with the latest firmware and kernels.

Using the features

Originally these features were only available by directly reading registers on the PMIC itself. However, the register addresses vary depending on the PMIC used (and therefore on the board revision), so Raspberry Pi Ltd has provided a revision-agnostic way of getting this information. This involves using the command line tool vcgencmd, which is a program that allows user space applications to access information stored in or accessed from the Raspberry Pi Ltd device's firmware.

The available vcgencmd commands are as follows:

Command	Description
vcgencmd measure_volts usb_pd	Measures the voltage on the pin marked usb_pd (See C M4 IO schematic). CM4 only.
vcgencmd measure_volts ain1	Measures the voltage on the pin marked ain1 (See CM 4 IO schematic). CM4 only.
vcgencmd measure_temp pmic	Measures the temperature of the PMIC die. CM4 and R aspberry Pi 4 and 5.

All of these commands are run from the Linux command line.

Using the features from program code

It is possible to use these vcgencmd commands programmatically if you need the information inside an application. In both Python and C, an OS call can be used to run the command and return the result as a string. Here is some example Python code that can be used to call the vcgencmd command:

```
import subprocess

# call vcgencmd and pass in a command
output = subprocess.check_output(['vcgencmd', 'measure_temp', 'pmic'])

# print the output of the command
print(output)
```

This code uses the Python subprocess module to call the vcgencmd command and pass in the measure_temp command targetting the pmic, which will measure the temperature of the PMIC die. The output of the command will be printed to the console.

Here is a similar example in C:

```
#include <stdio.h>
#include <stdlib.h>
#include <unistd.h>

int main() {
  char *cmd = "vcgencmd measure_temp pmic";
  char buffer[128];
  FILE *pipe = popen(cmd, "r");

  if (!pipe)
  {
    perror("popen");
    return 1;
  }

  while (!feof(pipe))
  {
    if (fgets(buffer, 128, pipe) != NULL)
    {
      printf("%s", buffer);
    }
  }

  pclose(pipe);
  return 0;
}
```

The C code uses popen (rather than system(), which would also be an option), and is probably a little more verbose than it needs to be because it can handle multiple line results from the call, whereas vcgencmd returns only a single line of text.

NOTE

These code extracts are supplied only as examples, and you may need to modify them depending on your specific needs. For example, you may want to parse the output of the vcgencmd command to extract the temperature value for later use.

Frequently Asked Questions

- **Q: Can I use these features on all Raspberry Pi models?**
  - A: No, these features are specifically available for Raspberry Pi 4, Raspberry Pi 5, and Compute Module 4 devices.
- **Q: Is it safe to rely on these features for future use?**
  - A: There is no guarantee that this functionality will be maintained in future PMIC versions, so caution is advised when using these features.

Documents / Resources

	Raspberry Pi Raspberry Pi 5 Extra PMIC Compute Module 4 [pdf] Instruction Manual Raspberry Pi 4, Raspberry Pi 5, Compute Module 4, Raspberry Pi 5 Extra PMIC Compute Module 4, Raspberry Pi 5, Extra PMIC Compute Module 4, Compute Module 4

References

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- User Manual

Raspberry Pi

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