RISC-V MCU development boards

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Introduction

"How do I get my feet wet with RISC-V?" is a very common question, which is often answered "Buy a RISC-V development board, and practice bare metal development."

This document provides guidance on part selection, as well as pointers to useful resources. It is not a comprehensive guide of RISC-V MCU, but rather a short list of easily approachable parts. To be listed in this guide, parts **must** meet several criteria:

- have decent English documentation,
- have open-source or freely downloadable supporting software,
- be easily available from anywhere in the world, e.g. through AliExpress or LCSC,
- have cheap development boards as easily available as the chips,
- not require a Chinese mobile phone number to download software or documentation.

License

Manufacturer selection

MCU manufacturers have different product strategies, leading to different product ranges. An easy and efficient method is to select a manufacturer whose strategy matches your needs, and then see which of their parts best suits your project.

Manufacturer	*Wide supply voltage range*	*Wide package choice*	*Lots of I/O pins*	*WiFi*	*BLE*	*802.15.4*
BouffaloLab				x	x	x
Espressif				x	x	x
GigaDevice			x			
WCH	x	x	x		x	

Note: manufacturers are sorted in alphabetical order.

BouffaloLab

Chinese name: 博流智能 (or just 博流) – pinyin: bó liú zhìnéng

BouffaloLab only manufactures RISC-V chips, so they're undoubtedly committed to this platform. They have a wide range of IoT-oriented MCU, some with SiFive IP, others with T-Head IP. The documentation is good, but their SDK and code examples are a bit chaotic.

2023-06-27: note that this situation is improving as BouffaloLab is working on a unified SDK (bouffalo_sdk) to replace the old bl_mcu_sdk and bl_iot_sdk.

The following table presents the main differences between BouffaloLab's RISC-V SoC (not the modules):

Part	*MHz*	*RAM*	*CPU*	*WiFi*	*BT*	*BLE*	*802.15.4*	*USB*	*Ethernet*	*Camera*	*AI NPU*
BL602/ BL604	192	276K	RV32IMAFC	b/g/n	no	yes	no	no	no	no	no
BL702	144	132K	RV32IMAFC	no	no	yes	yes	yes	no	no	no
BL704	144	132K	RV32IMAFC	no	no	yes	yes	yes	yes	no	no
BL706	144	132K	RV32IMAFC	no	no	yes	yes	yes	yes	yes	no
BL616/ BL618 *****	320	480K	RV32IMAFCP	b/g/n/ax	yes	yes	yes	yes	yes	yes	no
BL808	480	64M	RV32IMAFCP+ RV**64**IMAFCV+ RV32EMC	b/g/n	yes	yes	yes	yes	yes	yes	yes

***: the BL616 and BL618 are ultra-low-power wireless MCU.*

I chose to include the BL808 because it is exceedingly powerful for an MCU, but very limited for a Linux-capable SoC, so it makes sense to include it in both documents.

I didn't include the BL606P because as of 2023-06-27, BouffaloLab provides no technical documentation about it, and neither chips, nor development boards are available for purchase.

Finally, the BL604, is a higher pin count version of the BL602, and the BL618, a higher pin count version of the BL616.

Advice to beginners

Pine64 has released a well-documented development board (PineCone) and a module (PineNut), both based on the BL602 MCU, and Lee Lup Yuen has produced excellent training material for this board, so this is what you want to use for your first steps.

Energy efficiency

Since the early days of the BL602, BouffaloLab has always paid attention to energy efficiency. This commitment is confirmed today by the priority they give to the BL616/618, their ultra-low-power MCU. If they meet your needs, these are the MCU you want to focus on.

Compute power & embedded AI

The BL808 is a great choice for applications that need significant compute power while staying energy efficient, and for applications incorporating AI-based features.

Documentation, SDK and tools

Data sheets & reference manuals: https://github.com/bouffalolab/bl_docs

SDK:

https://github.com/bouffalolab/bouffalo_sdk (newer SDK)
https://github.com/bouffalolab/bl_iot_sdk (older SDK)
Note: the older SDK may still be needed until the newer has full peripheral coverage (e.g. to use WiFi on the BL808).
https://dev.bouffalolab.com/download

Flashing tool (BlDevCube): https://github.com/bouffalolab/flash_tools

GitHub: https://github.com/bouffalolab

Developer forum: https://bbs.bouffalolab.com/t/english-forum

Interesting information not found in BouffaloLab documents: https://github.com/pine64/

BL602

Third-party development board: PineCone

Purchase link: https://pine64.com/product/pinecone-bl602-evaluation-board/

Documentation: https://wiki.pine64.org/wiki/PineCone

Review: https://lupyuen.github.io/articles/pinecone

Tutorials: https://lupyuen.github.io/articles/book

Third-party development board: Ai-WB2 series

Purchase links (Ai-WB2-12F-Kit: 11 I/O):

https://www.aliexpress.com/item/1005004911487557.html
https://www.aliexpress.com/item/1005005256873547.html

Purchase links (Ai-WB2-13-Kit: 11 I/O):

https://www.aliexpress.com/item/1005004911837141.html
https://www.aliexpress.com/item/1005005256844150.html

Purchase links (Ai-WB2-32S-Kit: 15 I/O):

https://www.aliexpress.com/item/1005004911645385.html
https://www.aliexpress.com/item/1005005256875832.html

Documentation: https://docs.ai-thinker.com/en/wb2

GitHub: https://github.com/Ai-Thinker-Open/Ai-Thinker-WB2

Third-party development board: DT-BL10 or XT-BL12

Purchase links:

https://www.aliexpress.com/item/1005005083839351.html
https://www.aliexpress.com/item/1005003695650307.html

Documentation: https://xzrnllk27j.k.topthink.com/@xgr3x6lrjy/BL602.html

BL702

Third-party development board: M0 Sense

Purchase links:

https://www.aliexpress.com/item/1005005373072135.html
https://www.aliexpress.com/item/1005005012406688.html

Documentation: https://dl.sipeed.com/shareURL/Maix-Zero/M0sense

GitHub: https://github.com/sipeed/M0sense_BL702_example

Third-party development board: XT-ZB1

Purchase links:

https://www.aliexpress.com/item/1005004134568356.html
https://www.aliexpress.com/item/1005003747200098.html

Documentation: https://xzrnllk27j.k.topthink.com/@xgr3x6lrjy/BL702.html

BL616

Third-party development board: M0S Dock

Purchase links:

https://www.aliexpress.com/item/1005005373075939.html
https://www.aliexpress.com/item/1005005142466936.html

Documentation: https://dl.sipeed.com/shareURL/Maix-Zero/M0S

GitHub: https://github.com/sipeed/M0S_BL616_example

Third-party development board: Ai-M62-12F

Purchase links:

https://www.aliexpress.com/item/1005005407942430.html
https://www.aliexpress.com/item/1005005438854506.html

Documentation: https://docs.ai-thinker.com/en/ai_m62

GitHub: https://github.com/Ai-Thinker-Open/aithinker_Ai-M6X_SDK

BL618

Third-party development board: M0P Dock

Purchase link: https://www.aliexpress.com/item/1005005461103465.html

Documentation: https://dl.sipeed.com/shareURL/Maix-Zero/M0P

GitHub: https://github.com/sipeed/M0P_BL618_examples

Third-party development board: Ai-M61-32S

Purchase links:

https://www.aliexpress.com/item/1005005407539968.html
https://www.aliexpress.com/item/1005005407935386.html

Documentation: https://docs.ai-thinker.com/en/ai_m61

GitHub: https://github.com/Ai-Thinker-Open/aithinker_Ai-M6X_SDK

BL808

Third-party development board: Ox64

Purchase link: https://pine64.com/product-category/ox64/

Documentation: https://wiki.pine64.org/wiki/Ox64

Third-party development board: M1S Dock

Purchase links:

https://www.aliexpress.com/item/1005004996572935.html
https://www.aliexpress.com/item/1005004996668405.html
https://www.aliexpress.com/item/1005004996731092.html
https://www.aliexpress.com/item/1005004970779483.html

Documentation: https://dl.sipeed.com/shareURL/MAIX/M1s

GitHub:

https://github.com/sipeed/M1s_BL808_example
https://github.com/sipeed/M1s_BL808_SDK
https://github.com/sipeed/M1s_BL808_Linux_SDK

Espressif

Chinese name: 乐鑫科技 – Pinyin: lè xīn kējì

Espressif is famous for their Xtensa-based ESP32 and ESP32-S3 modules, but they also announced their new developments would be made on RISC-V, so interesting things are to be expected from them. Like BouffaloLab, they focus on IoT-oriented MCU.

Their current RISC-V product range includes the ESP32-C2/ESP8684, ESP32-C3/ESP8685, ESP32-C6, and ESP32-H2.

The following table presents the main differences between Espressif's RISC-V SoC (not the modules):

Part	*Pins*	*RV32*	*Max. freq.*	*RAM*	*Max. flash*	*WiFi*	*BLE*	*802.15.4*	*Notes*
ESP8684	24	IMC	120 MHz	272K	4M	b/g/n	yes	no	Aka. ESP32-C2
ESP32-C3	32	IMC	160 MHz	400K	4M	b/g/n	yes	no	
ESP8685	28	IMC	160 MHz	400K	4M	b/g/n	yes	no	
ESP32-C6	40	IMAC	160 MHz	512K	4M	b/g/n/ax	yes	yes	Has 2 CPU (one low power)
ESP32-H2	32	IMAC	96 MHz	320K	4M	no	yes	yes	Low-power applications

GitHub: https://github.com/espressif

The SDK for all Espressif products is called **ESP-IDF**. It is available from GitHub, or can be downloaded from there: https://www.espressif.com/en/support/download/all?keys=&field_type_tid%5B%5D=785

ESP8684 (ESP32-C2)

Official development board: ESP8684-DevKitM-1

Purchase link: https://www.aliexpress.com/item/1005004436990376.html

Documentation: https://docs.espressif.com/projects/espressif-esp-dev-kits/en/latest/esp8684/esp8684-devkitm-1/index.html

Third-party development board: ESPC2-12

Purchase links:

https://www.aliexpress.com/item/1005004861021167.html
https://www.aliexpress.com/item/1005004708803007.html

Documentation: http://bbs.doit.am/forum.php?mod=viewthread&tid=489&extra=page%3D1

Documentation

https://www.espressif.com/en/support/documents/technical-documents?keys=&field_type_tid%5B%5D=956

Relevant documents are *ESP8684 Datasheet*, *ESP8684 Technical Reference Manual, and ESP32-C2 Series SoC Errata*.

ESP32-C3 and ESP8685

Official development board: ESP32-C3-DevKitM-1

Purchase link: https://www.aliexpress.com/item/1005003989099547.html

Documentation: https://docs.espressif.com/projects/esp-idf/en/latest/esp32c3/hw-reference/esp32c3/user-guide-devkitm-1.html

Third-party development board: ESP32-C3FH4

Purchase link: https://www.aliexpress.com/item/1005004960064227.html

Documentation: https://github.com/WeActStudio/WeActStudio.ESP32C3CoreBoard

Third-party development board: nanoESP32-C3

Purchase link: https://www.aliexpress.com/item/1005003081928629.html

Documentation: https://github.com/wuxx/nanoESP32-C3

Third-party development board: YD-ESP32-C3

Purchase links:

https://www.aliexpress.com/item/1005004639250865.html
https://www.aliexpress.com/item/1005003613170790.html

Documentation: http://www.vcc-gnd.com/

Breaks the ESP32-C3's USB interface out and provides a separate USB-to-serial interface.

Third-party development board: XIAO ESP32C3

Purchase link: https://www.aliexpress.com/item/33011482127.html

Documentation: https://wiki.seeedstudio.com/XIAO_ESP32C3_Getting_Started/

Third-party development board: ESP32C3-MINI-DK

Purchase links:

https://www.aliexpress.com/item/1005004994621831.html
https://www.aliexpress.com/i/1005004945580114.html
https://www.aliexpress.com/item/1005004945500567.html

Has similar features as the ESP32-C3-DevKitC-02 except uses ESP32-C3-MINI-1 instead of ESP32-C3-WROOM-02 and CH340 instead of CP2102, and costs half the price.

Third-party development board: ESP32-C3 Mini

Purchase links:

https://www.aliexpress.com/item/1005005780121305.html
https://www.aliexpress.com/item/1005005757810089.html
https://www.aliexpress.com/item/1005005692188666.html

Ultra-miniature development board with 16 pins and a ceramic antenna.

Documentation

https://www.espressif.com/en/support/documents/technical-documents?keys=&field_type_tid%5B%5D=785

Relevant documents are *ESP32-C3 Datasheet*, *ESP32-C3 Technical Reference Manual*, and *ESP32-C3 Series SoC Errata*.

ESP32-C6

Official development board: ESP32-C6-DevKitC-1

Purchase link: https://www.aliexpress.com/item/1005005087160183.html

Documentation: https://docs.espressif.com/projects/espressif-esp-dev-kits/en/latest/esp32c6/esp32-c6-devkitc-1/index.html

Third-party development board: WeAct ESP32-C6-A

Purchase link: https://www.aliexpress.com/item/1005005569520224.html

No GitHub yet, but very similar in its design to WeAct's ESP32-S3-A board.

Third-party development board: nanoESP32-C6

Purchase link: https://www.aliexpress.com/item/1005005508686571.html

GitHub: https://github.com/wuxx/nanoESP32-C6

Documentation

Data sheets & reference manuals:

https://www.espressif.com/en/support/documents/technical-documents?keys=&field_type_tid%5B%5D=1177

Relevant documents are *ESP32-C6 Datasheet*, *ESP32-C6 Technical Reference Manual*.

ESP32-H2

Official development board: ESP32-H2-DevKitM-1

Purchase link: https://www.aliexpress.com/item/1005005252175587.html

Documentation: https://docs.espressif.com/projects/espressif-esp-dev-kits/en/latest/esp32h2/esp32-h2-devkitm-1/index.html

Documentation

https://www.espressif.com/en/support/documents/technical-documents?keys=&field_type_tid%5B%5D=1211

Relevant documents are *ESP32-H2 Datasheet*, and *ESP32-H3 Technical Reference Manual*.

GigaDevice

Chinese name: 兆易创新 – Pinyin: zhào yì chuàngxīn

While GigaDevice have largely developed their ARM MCU portfolio in the past years, the GD32VF103 is still their only one RISC-V MCU. It's a very interesting part, but unfortunately out-of-stock to date (June 2023), and GigaDevice not being committed to RISC-V doesn't bode well of its future. Anyway, there are still development boards available for the GD32VF103 and plenty of articles and tutorials can be found on the web, so you might want to give it a try.

Official development board: GD32VF103C-START

Purchase link: https://www.lcsc.com/product-detail/C432220.html

Note: this evaluation board includes GigaDevice's GDLink programmer.

Third-party development board: Longan Nano

Purchase links:

https://www.aliexpress.com/item/1005002542610332.html
https://www.aliexpress.com/item/1005003467064600.html

Documentation: https://github.com/sipeed/Longan-DOC

Downloads: https://dl.sipeed.com/shareURL/LONGAN/Nano

Note: an additional JTAG adapter is needed to program the chip. If you don't already have one (e.g. JLink), you can buy Sipeed's USB-JTAG/TTL.

Purchase link: https://www.aliexpress.com/item/1005002714665888.html

Documentation, SDK and tools

Download URL: https://www.gd32mcu.com/en/download?kw=GD32VF1

Data sheets & reference manuals: relevant documents are *GD32VF103xx Datasheet* and *GD32VF103 User Manual*.

SDK: relevant archive is *GD32VF103 Firmware Library*.

WCH

Chinese name: 南京沁恒 (or just 沁恒) – Pinyin: nánjīng qìn héng

WCH provides a much wider range of RISC-V MCU than any other manufacturer. For this reason, each chip has its own section below.

WCH's offer is divided in 2 families, the general purpose CH32V*xxx* series, which are the RISC-V equivalents of their ARM CH32F*xxx* series, and the more specialised CH*xxx* series, which use a slightly different peripheral set.

An interesting thing to note is the CH32V003 doesn't have an ARM equivalent, which could be a hint that, like Espressif, WCH will continue to concentrate their efforts on their RISC-V products.

The following table presents the main differences between WCH's RISC-V MCU:

Part+GitHub	*RV32*	*Core*	*Max. freq.*	*Max. flash*	*Max. RAM*	*Voltage*	*Notes*
CH32V003	EC	V2A	48 MHz	16K	2K	2.7-5.5V	Low pin count (8, 16, 20)
CH32V103	IMAC	V3A	80 MHz	64K	20K	2.7-5.5V	
CH32V203	IMAC	V4B	144 MHz	128K	64K	2.4-3.6V	LQFP-64 has Ethernet
CH32V208	IMAC	V4C	144 MHz	128K	64K	2.4-3.6V	BLE + Ethernet
CH32V303	IMAFC	V4F	144 MHz	256K	64K	2.4-3.6V	
CH32V305	IMAFC	V4F	144 MHz	128K	32K	2.4-3.6V	
CH32V307	IMAFC	V4F	144 MHz	256K	64K	2.4-3.6V	Has Ethernet. LQFP-100 has DVP & FSMC
CH565	IMAC	V3A	120 MHz	448K	96K	2.3-3.6V	USB 3.0, Gb Ethernet, EMMC, DVP
CH569	IMAC	V3A	120 MHz	448K	96K	2.3-3.6V	USB 3.0, Gb Ethernet, EMMC, HSPI
CH573/571	IMAC	V3A	60 MHz	448K	16K	2.3-3.6V	Superseded by the CH582
CH583/582	IMAC	V4A	80 MHz	448K	30K	2.3-3.6V	BLE, ultra low power
CH592/591	IMAC	V4C	80 MHz	448K	24K	2.3-3.6V	BLE, ultra low power, LCD controller
CH643	IMAC	V4C	48 MHz	62K	20K	2.0-5.5V	USB PD, PIOC, RGB LED PWM
CH32X035	IMAC	V4C	48 MHz	62K	20K	2.0-5.5V	USB PD, PIOC, OpAmp / PGA / comp.

PIOC: programmable I/O protocol controller / PGA: programmable gain amplifier

Note: Development boards for the CH592 and CH643 are not available yet as of 2023-06-27. Development boards for the CH573 have intentionally been omitted.

For further details, here is a selection table covering the whole WCH offer: https://special.wch.cn/en/mcu/

Note: all WCH MCU SDK include the schematics of the official evaluation boards as reference design.

GitHub: https://github.com/openwch

Programmer / debugger

A proprietary programmer / debugger is needed to flash WCH chips, the WCH-LinkE.

Purchase links:

https://www.aliexpress.com/item/1005004881582037.html
https://www.aliexpress.com/item/1005004964197577.html
https://www.aliexpress.com/item/1005005244468643.html

One is already included with the CH32V003 evaluation kit, and the CH32V003 + CH32V203 evaluation kit combo from WCH.

Note: you may also come across the WCH-Link (without final E) on AliExpress. It is the predecessor of the WCH-LinkE and does not support the CH32V003.

Flashing tool

WCH provides 2 flashing tools, WCHISPTool (Windows application) and WCHISPTool_CMD (multi-platform command-line tool).

Download links:

https://www.wch.cn/downloads/WCHISPTool_Setup_exe.html
https://www.wch.cn/downloads/WCHISPTool_CMD_ZIP.html

Notes to Linux users

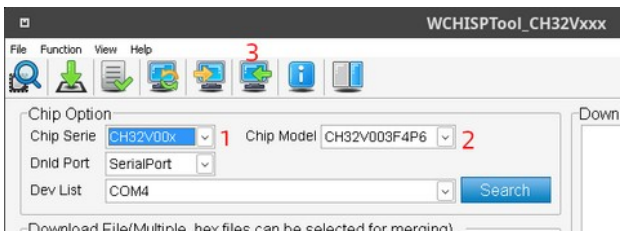
WCHISPTool's main executable is unusable under Wine, but independent executables for each MCU series are provided under its installation directory and those work quite well.

To run it, let's say you installed WCHISPTool in ~/.wine/drive_c/WCHISPTool and you want to flash a CH582M, open a terminal window and type:

```
cd ~/.wine/drive_c/WCHISPTool
wine WCHISPTool_CH57x-59x/WCHISPTool_CH57x-59x.exe
```

Alternatively, you can add ~/.wine/drive_c/WCHISPTool to the Windows PATH and directly run the appropriate executable with Wine.

WCHISPTool_CMD, the multi-platform command-line tool, uses configuration files generated by WCHISPTool. To create one, start the WCHISPTool variant matching your MCU series, select the chip series (1), the chip model (2), click the "Save UI config" button (3) and save it in your project's source folder.



You can also flash your MCU with OpenOCD, but you must first unlock the flash write protection using the WCHISPTool matching its series.

MounRiver IDE

MounRiver Community Edition is an Eclipse-based IDE supporting all RISC-V and ARM WCH MCU, available for Windows, Linux and Mac.

Download link: http://www.mounriver.com/download

Stand alone tool chain

WCH provides modified versions of OpenOCD and GCC to support their MCU's specific features. These are included with MounRiver, but can also be downloaded separately from MounRiver's download page, e.g. for installation on a continuous integration server.

Alternatives to WCH tools

If you would like to use mainstream GCC instead of WCH's, or to try an open-source flashing tool, the following Reddit threads will be of interest to you:

https://www.reddit.com/r/RISCV/comments/115u6i9/comment/j94xvpq/
https://www.reddit.com/r/RISCV/comments/126262j/

CH32V003

Official development board

Purchase link: https://www.aliexpress.com/item/1005004895791296.html

Third-party development board: nanoCH32V003

Purchase links:

https://www.aliexpress.com/item/1005005221751705.html
https://www.aliexpress.com/item/1005005222228477.html

Documentation: https://github.com/wuxx/nanoCH32V003

Third-party development board: QSZNTEC CH32V003

Purchase links:

https://www.aliexpress.com/item/1005004964355080.html
https://www.aliexpress.com/item/1005005137124754.html

Third-party development board: Twen CH32V003

Purchase link: https://www.aliexpress.com/item/1005005343785386.html

Note: doesn't have a crystal, so all GPIO pins are available.

Documentation and SDK

Data sheet: http://wch-ic.com/downloads/CH32V003DS0_PDF.html

Reference manual: http://wch-ic.com/downloads/CH32V003RM_PDF.html

Processor manual: http://wch-ic.com/downloads/QingKeV2_Processor_Manual_PDF.html

SDK: https://www.wch.cn/downloads/CH32V003EVT_ZIP.html

CH32V103

Official development board

Purchase links:

https://www.lcsc.com/product-detail/C2943983.html
https://www.lcsc.com/product-detail/C2943982.html
https://www.aliexpress.com/item/1005004607642695.html

Documentation and SDK

Data sheet: http://wch-ic.com/downloads/CH32V103DS0_PDF.html

Reference manual: http://wch-ic.com/downloads/CH32xRM_PDF.html

Processor manual: http://wch-ic.com/downloads/QingKeV3_Processor_Manual_PDF.html

SDK: https://www.wch.cn/downloads/CH32V103EVT_ZIP.html

CH32V203

Official development board

Purchase link: https://www.aliexpress.com/item/1005004493040662.html

Third-party development board: BluePill+ CH32V203

Purchase link: https://www.aliexpress.com/item/1005001474741936.html

Documentation: https://github.com/WeActStudio/WeActStudio.BluePill-Plus-CH32

Note: this board initially shipped with a CH32V103C8T6, but now uses a CH32V203C8T6.

Third-party development board: nanoCH32V203

Purchase link: https://www.aliexpress.com/item/1005004908206775.html

Documentation: https://github.com/wuxx/nanoCH32V203

Documentation and SDK

Data sheet: http://wch-ic.com/downloads/CH32V203DS0_PDF.html

Reference manual: http://wch-ic.com/downloads/CH32FV2x_V3xRM_PDF.html

Processor manual: http://wch-ic.com/downloads/QingKeV4_Processor_Manual_PDF.html

SDK: https://www.wch.cn/downloads/CH32V20XEVT_ZIP.html

CH32V208

Official development board

Purchase link: https://www.aliexpress.com/item/1005004924242063.html

Documentation and SDK

Data sheet: http://wch-ic.com/downloads/CH32V208DS0_PDF.html

Reference manual: http://wch-ic.com/downloads/CH32FV2x_V3xRM_PDF.html

Processor manual: http://wch-ic.com/downloads/QingKeV4_Processor_Manual_PDF.html

SDK: https://www.wch.cn/downloads/CH32V20XEVT_ZIP.html

CH32V303

Official development board

Purchase link: https://www.aliexpress.com/item/1005005444077007.html

Documentation and SDK

Data sheet: http://wch-ic.com/downloads/CH32V307DS0_PDF.html

Reference manual: http://wch-ic.com/downloads/CH32FV2x_V3xRM_PDF.html

Processor manual: http://wch-ic.com/downloads/QingKeV4_Processor_Manual_PDF.html

SDK: https://www.wch.cn/downloads/CH32V307EVT_ZIP.html

CH32V305

Third-party development board: nanoCH32V305

Purchase link: https://www.aliexpress.com/item/1005005033298927.html

Documentation: https://github.com/wuxx/nanoCH32V305

Documentation and SDK

Data sheet: http://wch-ic.com/downloads/CH32V307DS0_PDF.html

Reference manual: http://wch-ic.com/downloads/CH32FV2x_V3xRM_PDF.html

Processor manual: http://wch-ic.com/downloads/QingKeV4_Processor_Manual_PDF.html

SDK: https://www.wch.cn/downloads/CH32V307EVT_ZIP.html

CH32V307

Official development board

Purchase link: https://www.lcsc.com/product-detail/C2943980.html

Third-party development board: YD-CH32V307VC

Purchase links:

https://www.aliexpress.com/item/1005004367173443.html
https://www.aliexpress.com/item/1005005131511036.html

Documentation: http://www.vcc-gnd.com/

Third-party development board: CH32V307RC-MINI

Purchase link: https://www.aliexpress.com/item/1005005175678285.html

Documentation and SDK

Data sheet: http://wch-ic.com/downloads/CH32V307DS0_PDF.html

Reference manual: http://wch-ic.com/downloads/CH32FV2x_V3xRM_PDF.html

Processor manual: http://wch-ic.com/downloads/QingKeV4_Processor_Manual_PDF.html

SDK: https://www.wch.cn/downloads/CH32V307EVT_ZIP.html

CH32X035

Official development board

Purchase link: https://www.aliexpress.com/item/1005005718558442.html

Documentation and SDK

Data sheet: http://wch-ic.com/downloads/CH32X035DS0_PDF.html

Reference manual: http://wch-ic.com/downloads/CH32X035RM_PDF.html

Processor manual: http://wch-ic.com/downloads/QingKeV4_Processor_Manual_PDF.html

SDK: https://www.wch.cn/downloads/CH32X035EVT_ZIP.html

CH565

Official development board

Purchase link: https://www.aliexpress.com/item/1005004346104186.html

Documentation and SDK

Same as CH569.

CH569

Official development board

Purchase links:

- https://www.lcsc.com/product-detail/C3001176.html
- https://www.aliexpress.com/item/1005004328816871.html

Documentation and SDK

Data sheet: http://wch-ic.com/downloads/CH569DS1_PDF.html

Processor manual: http://wch-ic.com/downloads/QingKeV3_Processor_Manual_PDF.html

SDK: https://www.wch.cn/downloads/CH569EVT_ZIP.html

CH582 / CH583

Official development board

Purchase links:

- https://www.lcsc.com/product-detail/C2943981.html (CH582M)
- https://www.aliexpress.com/item/1005005060737000.html (CH582M and CH583M)
- https://www.aliexpress.com/item/1005005493310632.html (CH583M)
- https://www.aliexpress.com/item/1005004346585597.html (CH582F)

Third-party development board: YD-CH58x

Purchase links:

- https://www.aliexpress.com/item/1005005305938011.html
- https://www.aliexpress.com/item/1005004787513484.html
- https://www.aliexpress.com/item/1005004794466027.html

Documentation: http://www.vcc-gnd.com/

Can be programmed and debugged using OpenOCD and a WCH-Link or WCH-LinkE programmer, so is suitable for use with Linux.

Third-party development board: 303CH582M01

Purchase links:

https://www.aliexpress.com/item/1005005458836770.html
https://www.aliexpress.com/item/1005005467071580.html
https://www.aliexpress.com/item/1005005456987838.html

Similar to YD-CH58x. After ordering, ask the seller for schematic diagram. Uses the USB C connector for programming, which at the moment only works under Windows.

Documentation and SDK

Data sheet: http://wch-ic.com/downloads/CH583DS1_PDF.html

Processor manual: http://wch-ic.com/downloads/QingKeV4_Processor_Manual_PDF.html

SDK: https://www.wch.cn/downloads/CH583EVT_ZIP.html

CVITEK

Chinese name: 晶视智能 – Pinyin: jīng shì zhìnéng

CVITEK seems to exclusively target the Chinese domestic market – their web site is unresponsive when accessed from outside China, and their documentation is available in Chinese only. Also, they don't seem to target the MCU market.

For these reasons, they shouldn't be included in this document. However, you might come across a development board using one of their CPU, the Milk-V Duo, which has been advertised in English-speaking channels and can be bought from AliExpress.

In case you're the adventurous type and don't mind being left on your own, here are a few details about this board.

Third-party development board: Milk-V Duo

Being Linux-capable, the Milk-V Duo's CPU (the CV1800B), is comparable to some extent to the BL808, including price-wise. The CV1800B includes two C906 cores, one fully-fledged, the other stripped down (no V extension, 700MHz instead of 1GHz), meaning no SMP (Symmetric Multi-Processing).

This design decision both greatly limits its interest as a Linux platform, and prevents its use in low-power applications (which the BL808 is suitable for). However, it might still be useful in applications where the compute power of two 64-bit cores is required but can accommodate limited memory (64MB).

Purchase links:

- https://www.aliexpress.com/item/1005005699215618.html
- https://www.aliexpress.com/item/1005005699176591.html
- https://www.aliexpress.com/item/1005005699023966.html

Documentation & SDK:

- https://milkv.io/duo (schematic & pinout, see bottom of page)
- https://milkv.io/docs/duo (work in progress)
- https://github.com/milkv-duo (SDK, examples, preliminary data sheet)