

Datasheet



ESP-CM3-S2 2.4 GHz WiFi (802.11 b/g/n) module ESP32S2
Xtensa® singlecore 32bit LX7 microprocessor
45 GPIOs, rich set of peripherals¹

1 Module Overview

1.1 Features

CPU and On-Chip Memory

ESP-CM3-S2

- ESP32-S2 or ESP32-S2R2 embedded, Xtensa® single-core 32-bit LX7 microprocessor, up to 240 MHz
- 128 KB ROM
- 320 KB SRAM
- 16 KB SRAM in RTC
- 2 MB PSRAM (ESP32-S2R2 only)

ESP-CM3-S3

- ESP32-S3R8V SoC embedded, Xtensa® dual-core 32-bit LX7 microprocessor (with single precision FPU), up to 240 MHz
- 384 KB ROM
- 512 KB SRAM
- 16 KB SRAM in RTC
- 8 MB PSRAM

WiFi

- 802.11 b/g/n
- Bit rate: 802.11n up to 150 Mbps
- A-MPDU and A-MSDU aggregation
- 0.4 µs guard interval support
- Center frequency range of operating channel: 2412 ~ 2484 MHz

Bluetooth (*only ESP-CM3-S3*)

- Bluetooth LE: Bluetooth 5, Bluetooth mesh

- Speed: 125 Kbps, 500 Kbps, 1 Mbps, 2 Mbps
- Advertising extensions
- Multiple advertisement sets
- Channel selection algorithm #2
- Internal co-existence mechanism between Wi-Fi and Bluetooth to share the same antenna

Peripherals

- GPIO, SPI, UART, I2C, full-speed USB OTG, temperature sensor, general-purpose timers, watchdog timers

Integrated Components on Module

- 40 MHz crystal oscillator
- Quad SPI flash up to 16 MB

Operating Conditions

- Operating voltage/Power supply: 3.0 ~ 3.6 V
- Operating ambient temperature: -40 ~ 85 °C

1.2 Description

Openthing 1 ESP-CM3 is a powerful, affordable, and accessible alternative to the Raspberry Pi Compute Module 3, based on the ESP32-S2 and ESP32-S3 microcontroller. The module includes 2 GPIO expanders that seamlessly complement the 45 GPIO pins of the RPi CM3. They are connected via I2C and the I2C channel can be switched between I2C-0 and I2C-1 through solder pads. The Openthing 1 ESP-CM3-S2 comes with 2.4 GHz Wi-Fi (802.11 b/g/n) only and the S3 flavor comes with 2.4 GHz Wi-Fi (802.11 b/g/n) and Bluetooth® 5 (LE).

1.2 Applications

- Generic Low-power IoT Sensor Hub
- Generic Low-power IoT Data Loggers
- Cameras for Video Streaming
- Over-the-top (OTT) Devices
- USB Devices
- Speech Recognition
- Image Recognition
- Mesh Network
- Home Automation
- Smart Home Control Panel
- Smart Building
- Industrial Automation
- Smart Agriculture
- Audio Applications
- Health Care Applications
- Wi-Fi-enabled Toys
- Wearable Electronics
- Retail & Catering Applications
- Smart POS Machines E

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2 Mechanical Specification

The ESP-CM3 module conform to JEDEC MO-224 mechanical specification for 200 pin DDR2 (1.8V) SODIMM modules and therefore should work with the many DDR2 SODIMM sockets available on the market. **(Please note that the pinout of the Compute Module is not the same as a DDR2 SODIMM module; they are not electrically compatible.)**

The ESP-CM3 Module PCB Thickness is 1.0mm +/- 0.1mm

3 Pin Assignment

ESP32S2-CM	CM3+	CM3+ Lite	Pin	Pin	CM3+	CM3+ Lite	ESP32S2-CM
GND			1	2	EMMC_DISABLE_N		NC
GPIO8	GPIO0		3	4	NC	SDX_VDD	NC
GPIO9	GPIO1		5	6	NC	SDX_VDD	NC
GND			7	8			GND
GPIO11	GPIO2		9	10	NC	SDX_CLK	NC
GPIO12	GPIO3		11	12	NC	SDX_CMD	NC
GND			13	14			GND
E1_IO0_0	GPIO4		15	16	NC	SDX_D0	NC
E1_IO0_1	GPIO5		17	18	NC	SDX_D1	NC
GND			19	20			GND
E1_IO0_2	GPIO6		21	22	NC	SDX_D2	NC
E1_IO0_3	GPIO7		23	24	NC	SDX_D3	GPIO0
GND			25	26			GND
GPIO4	GPIO8		27	28	GPIO28		E1_IO0_4
GPIO1	GPIO9		29	30	GPIO29		E1_IO0_5
GND			31	32			GND
GPIO3	GPIO10		33	34	GPIO30		E1_IO0_6
GPIO2	GPIO11		35	36	GPIO31		E1_IO0_7
GND			37	38			GND
3V3	GPIO0-27_VDD		39	40	GPIO0-27_VDD		3V3
				KEY			
3V3	GPIO28-45_VDD		41	42	GPIO28-45_VDD		3V3
GND			43	44			GND
E1_IO1_7	GPIO12		45	46	GPIO32		E2_IO0_2
E1_IO1_6	GPIO13		47	48	GPIO33		E2_IO0_3
GND			49	50			GND
GPIO43 TxD0	GPIO14		51	52	GPIO34		E2_IO0_4
GPIO44 RxD0	GPIO15		53	54	GPIO35		E2_IO0_5
GND			55	56			GND
GPIO15 RTS	GPIO16		57	58	GPIO36		E2_IO0_6
GPIO16 CTS	GPIO17		59	60	GPIO37		E2_IO0_7
GND			61	62			GND
GPIO8 V1SPI_CS	GPIO18		63	64	GPIO38		E2_IO1_7
GPIO5 V1SPI_MISO	GPIO19		65	66	GPIO39		E2_IO1_6
GND			67	68			GND
GPIO6 V1SPI_MOSI	GPIO20		69	70	GPIO40		E2_IO1_5
GPIO7 V1SPI_CLK	GPIO21		71	72	GPIO41		E2_IO1_4
GND			73	74			GND
E1_IO1_5	GPIO22		75	76	GPIO42		E2_IO1_3
E1_IO1_4	GPIO23		77	78	GPIO43		E2_IO1_2
GND			79	80			GND
E1_IO1_0	GPIO24		81	82	GPIO44		E2_IO1_1
E1_IO1_1	GPIO25		83	84	GPIO45		E2_IO1_0
GND			85	86			GND
E1_IO1_2	GPIO26		87	88	HDMI_HPD_N_1V8		NC
E1_IO1_3	GPIO27		89	90	EMMC_EN_N_1V8		NC
GND			91	92			GND
E2_IO0_0	DSIO_DN1		93	94	DSI1_DP0		NC
E2_IO0_1	DSIO_DP1		95	96	DSI1_DN0		NC
GND			97	98			GND
NC	DSIO_DN0		99	100	DSI1_CP		NC
NC	DSIO_DP0		101	102	DSI1_CN		NC
GND			103	104			GND
NC	DSIO_CN		105	106	DSI1_DP3		NC
NC	DSIO_CP		107	108	DSI1_DN3		NC
GND			109	110			GND
NC	HDMI_CLK_N		111	112	DSI1_DP2		NC
NC	HDMI_CLK_P		113	114	DSI1_DN2		NC
GND			115	116			GND
NC	HDMI_D0_N		117	118	DSI1_DP1		NC
NC	HDMI_D0_P		119	120	DSI1_DN1		NC
GND			121	122			GND
NC	HDMI_D1_N		123	124			NC
NC	HDMI_D1_P		125	126			NC
GND			127	128			NC
NC	HDMI_D2_N		129	130			NC
NC	HDMI_D2_P		131	132			NC
GND			133	134			GND
NC	CAM1_DP3		135	136	CAM0_DP0		NC
NC	CAM1_DN3		137	138	CAM0_DN0		NC
GND			139	140			GND
NC	CAM1_DP2		141	142	CAM0_CP		NC
NC	CAM1_DN2		143	144	CAM0_CN		NC
GND			145	146			GND
NC	CAM1_CP		147	148	CAM0_DP1		NC
NC	CAM1_CN		149	150	CAM0_DN1		NC
GND			151	152			GND
NC	CAM1_DP1		153	154			NC
NC	CAM1_DN1		155	156			NC
GND			157	158			NC
NC	CAM1_DP0		159	160			NC
NC	CAM1_DN0		161	162			NC
GND			163	164			GND
USB_DP			165	166	TVDAC		NC
USB_DM			167	168	USB_OTGID		NC
GND			169	170			GND
NC	HDMI_CEC		171	172	VC_TRST_N		NC
NC	HDMI_SDA		173	174	VC_TDI		NC
NC	HDMI_SCL		175	176	VC_TMS		NC
ESP_EN	RUN		177	178	VC_TDO		NC
NC			179	180	VC_TCK		NC
GND			181	182			GND
NC	1V8		183	184	1V8		NC
NC	1V8		185	186	1V8		NC
GND			187	188			GND
NC	VDAC		189	190	VDAC		NC
3V3			191	192			3V3
3V3			193	194			3V3
GND			195	196			GND
NC	VBAT		197	198	VBAT		NC
NC	VBAT		199	200	VBAT		NC

4 Electrical Characteristics

The ESP-CM3 Module only needs 3.3V power supplied to the Pins 39, 40, 41, 42 and 191, 192, 193, 194. If you want to know more about absolute maximum rating, recommended operating conditions or power consumption please read the datasheet of the corresponding [ESP32-S2 Datasheet](#) and/or [ESP32-S3 Datasheet](#)

5 Related Documentation and Resources

Related Links Collection

- GitHub Repository of the ESP-CM3 Project including all Schematics, Layouts and test code
[GitHub Repository](#)
- A Hackaday.io Project Page:
[Hackaday.io Project Page](#)
- The official Datasheet of the Raspberry Pi Compute Module 3+
[Raspberry Pi CM3+ Datasheet](#)

Contact Us

Send an E-Mail to info@open-things.de to ask for *Support, Sales Questions, Comments & Suggestions* or visit our Website www.open-things.de

6 Revision History

Date	Version	Release Notes
14.09.2023	v0.1	Preliminary release