ESP32-PICO-D4 Datasheet

Version 1.3

Espressif Systems

About This Document

This document provides an introduction to the specifications of the ESP32-PICO-D4 module.

Revision History

For revision history of this document, please refer to the last page.

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1. Overview

The ESP32-PICO-D4 is a System-in-Package (SIP) module that is based on ESP32, providing complete Wi-Fi and Bluetooth functionalities. The module has a size as small as (7.0±0.1) mm × (7.0±0.1) mm × (0.94±0.1) mm, thus requiring minimal PCB area. The module integrates a 4-MB SPI flash.

At the core of this module is the ESP32 chip*, which is a single 2.4 GHz Wi-Fi and Bluetooth combo chip designed with TSMC's 40 nm ultra-low power technology. ESP32-PICO-D4 integrates all peripheral components seamlessly, including a crystal oscillator, flash, filter capacitors and RF matching links in one single package. Given that no other peripheral components are involved, module welding and testing is not required either. As such, ESP32-PICO-D4 reduces the complexity of supply chain and improves control efficiency.

With its ultra-small size, robust performance and low-energy consumption, ESP32-PICO-D4 is well suited for any space-limited or battery-operated applications, such as wearable electronics, medical equipment, sensors and other IoT products.

Note:
* For details on ESP32, please refer to the document *ESP32 Datasheet*.

Table 1 provides the specifications of the ESP32-PICO-D4 module.

Table 1: ESP32-PICO-D4 Specifications

Categories	Items	Specifications
Wi-Fi	Protocols	802.11 b/g/n (802.11n up to 150 Mbps)
		A-MPDU and A-MSDU aggregation and 0.4 μs guard interval support
	Frequency range	2.4 ~ 2.5 GHz
Bluetooth	Protocols	Bluetooth V4.2 BR/EDR and BLE specification
	Radio	NZIF receiver with –97 dBm sensitivity
		Class-1, class-2 and class-3 transmitter
		AFH
	Audio	CVSD and SBC
Hardware	Module interface	ADC, DAC, touch sensor, SD/SDIO/MMC Host Controller, SPI, SDIO/SPI Slave Controller, EMAC, motor PWM, LED PWM, UART, I2C, I2S, infrared remote controller, GPIO
	On-chip sensor	Hall sensor
	On-board clock	40 MHz crystal
	Operating voltage/Power supply	2.7 ~ 3.6V
	Operating current	Average: 80 mA
	Minimum current delivered by power supply	500 mA
	Operating temperature range	–40°C ~ 85°C
	Package size	(7.0±0.1) mm x (7.0±0.1) mm x (0.94±0.1) mm

Categories	Items	Specifications
Software	Wi-Fi mode	Station/SoftAP/SoftAP+Station/P2P
	Wi-Fi security	WPA/WPA2/WPA2-Enterprise/WPS
	Encryption	AES/RSA/ECC/SHA
	Firmware upgrade	UART Download / OTA (via network / download and write firmware via host)
	Software development	Supports Cloud Server Development / SDK for custom firmware development
	Network protocols	IPv4, IPv6, SSL, TCP/UDP/HTTP/FTP/MQTT
	User configuration	AT instruction set, cloud server, Android/iOS app

2. Pin Definitions

2.1 Pin Layout

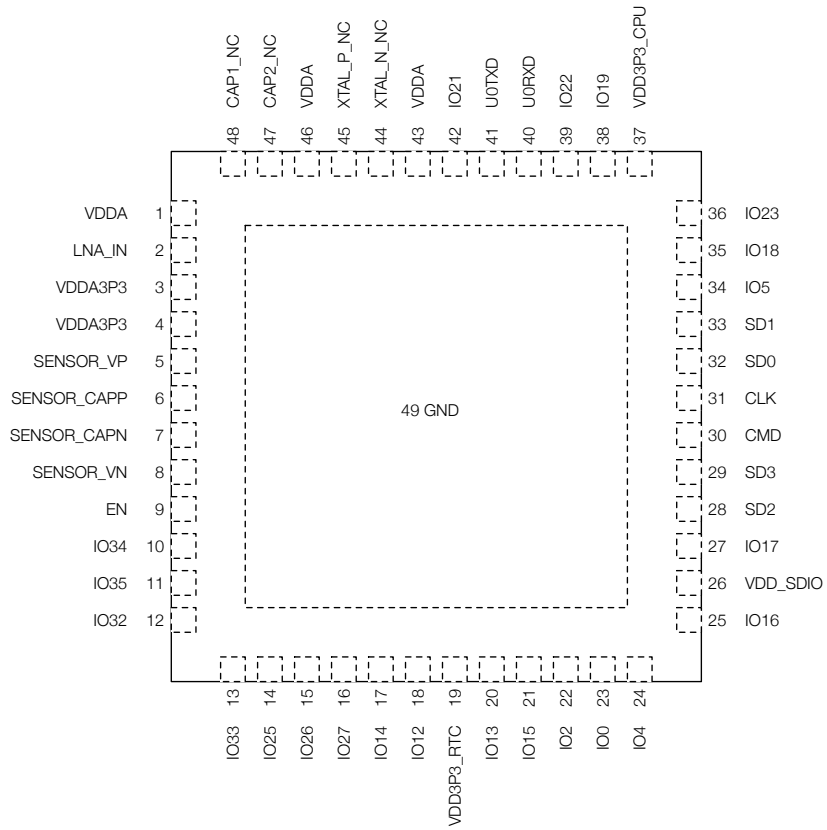


Figure 1: ESP32-PICO-D4 Pin Layout

2.2 Pin Description

The ESP32-PICO-D4 module has 48 pins. See pin definitions in Table 2.

Table 2: Pin Description

Name	No.	Type	Function
Analog			
VDDA	1	P	Analog power supply (2.3V ~ 3.6V)
LNA_IN	2	I/O	RF input and output
VDDA3P3	3	P	Analog power supply (2.3V ~ 3.6V)
VDDA3P3	4	P	Analog power supply (2.3V ~ 3.6V)
SENSOR_VP	5	I	GPIO36, ADC1_CH0, RTC_GPIO0
SENSOR_CAPP	6	I	GPIO37, ADC1_CH1, RTC_GPIO1
SENSOR_CAPN	7	I	GPIO38, ADC1_CH2, RTC_GPIO2
SENSOR_VN	8	I	GPIO39, ADC1_CH3, RTC_GPIO3

Name	No.	Type	Function
EN	9	I	High: On; enables the module Low: Off; resets the module Note: Do not leave this pin floating.
IO34	10	I	ADC1_CH6, RTC_GPIO4
IO35	11	I	ADC1_CH7, RTC_GPIO5
IO32	12	I/O	32K_XP (32.768 kHz crystal oscillator input), ADC1_CH4, TOUCH9, RTC_GPIO9
IO33	13	I/O	32K_XN (32.768 kHz crystal oscillator output), ADC1_CH5, TOUCH8, RTC_GPIO8
IO25	14	I/O	GPIO25, DAC_1, ADC2_CH8, RTC_GPIO6, EMAC_RXD0
IO26	15	I/O	GPIO26, DAC_2, ADC2_CH9, RTC_GPIO7, EMAC_RXD1
IO27	16	I/O	GPIO27, ADC2_CH7, TOUCH7, RTC_GPIO17, EMAC_RX_DV
IO14	17	I/O	ADC2_CH6, TOUCH6, RTC_GPIO16, MTMS, HSPICLK, HS2_CLK, SD_CLK, EMAC_TXD2
IO12	18	I/O	ADC2_CH5, TOUCH5, RTC_GPIO15, MTDI, HSPIQ, HS2_DATA2, SD_DATA2, EMAC_TXD3
VDD3P3_RTC	19	P	Input power supply for RTC IO (2.3V ~ 3.6V)
IO13	20	I/O	ADC2_CH4, TOUCH4, RTC_GPIO14, MTCK, HSPID, HS2_DATA3, SD_DATA3, EMAC_RX_ER
IO15	21	I/O	ADC2_CH3, TOUCH3, RTC_GPIO13, MTDO, HSPICS0, HS2_CMD, SD_CMD, EMAC_RXD3
IO2	22	I/O	ADC2_CH2, TOUCH2, RTC_GPIO12, HSPIWP, HS2_DATA0, SD_DATA0
IO0	23	I/O	ADC2_CH1, TOUCH1, RTC_GPIO11, CLK_OUT1, EMAC_TX_CLK
IO4	24	I/O	ADC2_CH0, TOUCH0, RTC_GPIO10, HSPIHD, HS2_DATA1, SD_DATA1, EMAC_TX_ER
IO16	25	I/O	GPIO16, HS1_DATA4, U2RXD, EMAC_CLK_OUT
VDD_SDIO	26	P	Output power supply: the same voltage as VDD3P3_RTC
IO17	27	I/O	GPIO17, HS1_DATA5, U2TXD, EMAC_CLK_OUT_180
SD2	28	I/O	GPIO9, SD_DATA2, SPIHD, HS1_DATA2, U1RXD
SD3	29	I/O	GPIO10, SD_DATA3, SPIWP, HS1_DATA3, U1TXD
CMD	30	I/O	GPIO11, SD_CMD, SPICS0, HS1_CMD, U1RTS
CLK	31	I/O	GPIO6, SD_CLK, SPICLK, HS1_CLK, U1CTS
SD0	32	I/O	GPIO7, SD_DATA0, SPIQ, HS1_DATA0, U2RTS
SD1	33	I/O	GPIO8, SD_DATA1, SPID, HS1_DATA1, U2CTS
IO5	34	I/O	GPIO5, VSPICS0, HS1_DATA6, EMAC_RX_CLK
IO18	35	I/O	GPIO18, VSPICLK, HS1_DATA7
IO23	36	I/O	GPIO23, VSPID, HS1_STROBE
VDD3P3_CPU	37	P	Input power supply for CPU IO (1.8V ~ 3.6V)
IO19	38	I/O	GPIO19, VSPIQ, U0CTS, EMAC_TXD0
IO22	39	I/O	GPIO22, VSPIWP, U0RTS, EMAC_TXD1
U0RXD	40	I/O	GPIO3, U0RXD, CLK_OUT2
U0TXD	41	I/O	GPIO1, U0TXD, CLK_OUT3, EMAC_RXD2
IO21	42	I/O	GPIO21, VSPIHD, EMAC_TX_EN

Name	No.	Type	Function
VDDA	43	P	Analog power supply (2.3V ~ 3.6V)
XTAL_N_NC	44	-	NC
XTAL_P_NC	45	-	NC
VDDA	46	P	Analog power supply (2.3V ~ 3.6V)
CAP2_NC	47	-	NC
CAP1_NC	48	-	NC

Important:

Pins IO16, IO17, CMD, CLK, SD0 and SD1 are used for connecting the embedded flash, and are not recommended for other uses.

2.3 Strapping Pins

ESP32 has five strapping pins, which can be seen in Chapter 6 Schematics:

- MTDI
- GPIO0
- GPIO2
- MTDO
- GPIO5

Software can read the values of these five bits from register "GPIO_STRAPPING".

During the chip's system reset (power-on-reset, RTC watchdog reset and brownout reset), the latches of the strapping pins sample the voltage level as strapping bits of "0" or "1", and hold these bits until the chip is powered down or shut down. The strapping bits configure the device's boot mode, the operating voltage of VDD_SDIO and other initial system settings.

Each strapping pin is connected to its internal pull-up/pull-down during the chip reset. Consequently, if a strapping pin is unconnected or the connected external circuit is high-impedance, the internal weak pull-up/pull-down will determine the default input level of the strapping pins.

To change the strapping bit values, users can apply the external pull-down/pull-up resistances, or use the host MCU's GPIOs to control the voltage level of these pins when powering on ESP32.

After reset, the strapping pins work as normal-function pins.

Refer to Table 3 for a detailed boot-mode configuration by strapping pins.

Table 3: Strapping Pins

Voltage of Internal LDO (VDD_SDIO)			
Pin	Default	3.3V	1.8V
MTDI	Pull-down	0	1
Booting Mode			
Pin	Default	SPI Boot	Download Boot
GPIO0	Pull-up	1	0

GPIO2	Pull-down	Don't-care		0	
Enabling/Disabling Debugging Log Print over U0TXD During Booting					
Pin	Default	U0TXD Toggling		U0TXD Silent	
MTDO	Pull-up	1		0	
Timing of SDIO Slave					
Pin	Default	Falling-edge Input Falling-edge Output	Falling-edge Input Rising-edge Output	Rising-edge Input Falling-edge Output	Rising-edge Input Rising-edge Output
MTDO	Pull-up	0	0	1	1
GPIO5	Pull-up	0	1	0	1

Note:

- Firmware can configure register bits to change the settings of "Voltage of Internal LDO (VDD_SDIO)" and "Timing of SDIO Slave", after booting.
- The operating voltage of ESP32-PICO-D4's integrated external SPI flash is 3.3V. Therefore, the strapping pin MTDI should hold bit "0" during the module power-on reset.

3. Functional Descriptions

This chapter describes the modules integrated in ESP32-PICO-D4, and their functions.

3.1 CPU and Internal Memory

ESP32 contains two low-power Xtensa® 32-bit LX6 microprocessors. The internal memory includes:

- 448 kB of ROM for booting and core functions.
- 520 kB of on-chip SRAM for data and instructions.
- 8 kB of SRAM in RTC, which is called RTC FAST Memory and can be used for data storage; it is accessed by the main CPU during RTC Boot from the Deep-sleep mode.
- 8 kB of SRAM in RTC, which is called RTC SLOW Memory and can be accessed by the co-processor during the Deep-sleep mode.
- 1 kbit of eFuse: 256 bits are used for the system (MAC address and chip configuration) and the remaining 768 bits are reserved for customer applications, including flash-encryption and chip-ID.

3.2 External Flash and SRAM

ESP32 supports multiple external QSPI flash and SRAM chips. More details can be found in Chapter SPI in the *ESP32 Technical Reference Manual*. ESP32 also supports hardware encryption/decryption based on AES to protect developers' programs and data in flash.

ESP32 can access the external QSPI flash and SRAM through high-speed caches.

- Up to 16 MB of external flash can be mapped into CPU instruction memory space and read-only memory space simultaneously.
  - When external flash is mapped into CPU instruction memory space, up to 11 MB+248 KB can be mapped at a time. Note that if more than 3 MB+248 KB are mapped, cache performance will be reduced due to speculative reads by the CPU.
  - When external flash is mapped into read-only data memory space, up to 4 MB can be mapped at a time. 8-bit, 16-bit and 32-bit reads are supported.
- External SRAM can be mapped into CPU data memory space. SRAM up to 8 MB is supported and up to 4 MB can be mapped at a time. 8-bit, 16-bit and 32-bit reads and writes are supported.

The ESP32-PICO-D4 module integrates 4 MB of external SPI flash. The 4-MB SPI flash can be memory-mapped onto the CPU code space, supporting 8, 16 and 32-bit access. Code execution is supported.

3.3 Crystal Oscillators

ESP32-PICO-D4 integrates a 40 MHz crystal oscillator.

3.4 RTC and Power Consumption

With the use of advanced power-management technologies, ESP32 can switch between different power modes.

- Power modes
  - Active mode: The chip radio is powered on. The chip can receive, transmit, or listen.
  - Modem-sleep mode: The CPU is operational and the clock is configurable. The Wi-Fi/Bluetooth baseband and radio are disabled.
  - Light-sleep mode: The CPU is paused. The RTC memory and RTC peripherals, as well as the ULP co-processor are running. Any wake-up events (MAC, host, RTC timer, or external interrupts) will wake up the chip.
  - Deep-sleep mode: Only RTC memory and RTC peripherals are powered on. Wi-Fi and Bluetooth connection data are stored in the RTC memory. The ULP co-processor is functional.
  - Hibernation mode: The internal 8-MHz oscillator and ULP co-processor are disabled. The RTC recovery memory is powered down. Only one RTC timer on the slow clock and certain RTC GPIOs are active. The RTC timer or the RTC GPIOs can wake up the chip from the Hibernation mode.

The power consumption varies with different power modes and work statuses of functional modules. Please see Table 4 for details.

Table 4: Power Consumption by Power Modes

Power mode	Description	Power consumption
Active (RF working)	Wi-Fi Tx packet	Please refer to *ESP32 Datasheet*.
	Wi-Fi / BT Tx packet	
	Wi-Fi / BT Rx and listening	
Modem-sleep	The CPU is powered on.	Max speed 240 MHz: 30 mA ~ 50 mA
		Normal speed 80 MHz: 20 mA ~ 25 mA
		Slow speed 2 MHz: 2 mA ~ 4 mA
Light-sleep	-	0.8 mA
Deep-sleep	The ULP co-processor is powered on.	150 μA
	ULP sensor-monitored pattern	100 μA @1% duty
	RTC timer + RTC memory	10 μA
Hibernation	RTC timer only	5 μA
Power off	CHIP_PU is set to low level, the chip is powered off	0.1 μA

Note:

- When Wi-Fi is enabled, the chip switches between Active and Modem-sleep mode. Therefore, power consumption changes accordingly.
- In Modem-sleep mode, the CPU frequency changes automatically. The frequency depends on the CPU load and the peripherals used.
- During Deep-sleep, when the ULP co-processor is powered on, peripherals such as GPIO and I2C are able to operate.
- When the system works in the ULP sensor-monitored pattern, the ULP co-processor works with the ULP sensor periodically; ADC works with a duty cycle of 1%, so the power consumption is 100 μA.

4. Peripherals and Sensors

Please refer to Section Peripherals and Sensors in *ESP32 Datasheet*.

Note:
External connections can be made to any GPIO except for GPIO16 and GPIO17. These two GPIOs are connected to the module's integrated SPI flash. For details, please see Section 6 Schematics.

5. Electrical Characteristics

5.1 Absolute Maximum Ratings

Stresses beyond the absolute maximum ratings listed in the table below may cause permanent damage to the device. These are stress ratings only, and do not refer to the functional operation of the device.

Table 5: Absolute Maximum Ratings

Symbol	Parameter	Min	Max	Unit
VDD33	-	–0.3	3.6	V
T_{store}	Storage temperature	–40	150	°C

5.2 Recommended Operating Conditions

Table 6: Recommended Operating Conditions

Symbol	Parameter	Min	Typical	Max	Unit
VDD33	-	2.7	3.3	3.6	V
I_{VDD}	Current delivered by external power supply	0.5	-	-	A
T	Operating temperature	–40	-	85	°C

5.3 DC Characteristics (3.3V, 25°C)

Table 7: DC Characteristics

Symbol	Parameter	Min	Typ	Max	Unit
C_{IN}	Pin capacitance	-	2	-	pF
V_{IH}	High-level input voltage	0.75 × VDD[1]	-	VDD + 0.3	V
V_{IL}	Low-level input voltage	–0.3	-	0.25 × VDD	V
I_{IH}	High-level input current	-	-	50	nA
I_{IL}	Low-level input current	-	-	50	nA
V_{OH}	High-level output voltage	0.8 × VDD	-	-	V
V_{OL}	Low-level output voltage	-	-	0.1 × VDD	V
I_{OH}	High-level source current (VDD = 3.3V, V_{OH} = 2.64V, PAD_DRIVER = 3)	-	40	-	mA
I_{OL}	Low-level sink current (VDD = 3.3V, V_{OL} = 0.495V, PAD_DRIVER = 3)	-	28	-	mA
R_{PU}	Pull-up resistor	-	45	-	kΩ
R_{PD}	Pull-down resistor	-	45	-	kΩ
V_{IL_nRST}	Low-level input voltage of EN to reset the module	-	-	0.6	V

1. VDD is the I/O voltage for a particular power domain of pins. More details can be found in Appendix IO_MUX of *ESP32 Datasheet*.

5.4 Wi-Fi Radio

Table 8: Wi-Fi Radio Characteristics

Description	Min	Typical	Max	Unit
Input frequency	2412	-	2484	MHz
Output impedance	-	50	-	Ω
Tx power				
Output power of PA for 72.2 Mbps	13	14	15	dBm
Output power of PA for 11b mode	19.5	20	20.5	dBm
Sensitivity				
DSSS, 1 Mbps	-	–98	-	dBm
CCK, 11 Mbps	-	–91	-	dBm
OFDM, 6 Mbps	-	–93	-	dBm
OFDM, 54 Mbps	-	–75	-	dBm
HT20, MCS0	-	–93	-	dBm
HT20, MCS7	-	–73	-	dBm
HT40, MCS0	-	–90	-	dBm
HT40, MCS7	-	–70	-	dBm
MCS32	-	–89	-	dBm
Adjacent channel rejection				
OFDM, 6 Mbps	-	37	-	dB
OFDM, 54 Mbps	-	21	-	dB
HT20, MCS0	-	37	-	dB
HT20, MCS7	-	20	-	dB

5.5 BLE Radio

5.5.1 Receiver

Table 9: Receiver Characteristics – BLE

Parameter	Conditions	Min	Typ	Max	Unit
Sensitivity @30.8% PER	-	-	–97	-	dBm
Maximum received signal @30.8% PER	-	0	-	-	dBm
Co-channel C/I	-	-	+10	-	dB
Adjacent channel selectivity C/I	F = F0 + 1 MHz	-	–5	-	dB
	F = F0 – 1 MHz	-	–5	-	dB
	F = F0 + 2 MHz	-	–25	-	dB
	F = F0 – 2 MHz	-	–35	-	dB
	F = F0 + 3 MHz	-	–25	-	dB
	F = F0 – 3 MHz	-	–45	-	dB
Out-of-band blocking performance	30 MHz ~ 2000 MHz	–10	-	-	dBm
	2000 MHz ~ 2400 MHz	–27	-	-	dBm
	2500 MHz ~ 3000 MHz	–27	-	-	dBm
	3000 MHz ~ 12.5 GHz	–10	-	-	dBm

Parameter	Conditions	Min	Typ	Max	Unit
Intermodulation	-	–36	-	-	dBm

5.5.2 Transmitter

Table 10: Transmitter Characteristics – BLE

Parameter	Conditions	Min	Typ	Max	Unit
RF transmit power	-	-	0	-	dBm
Gain control step	-	-	3	-	dBm
RF power control range	-	–12	-	+12	dBm
Adjacent channel transmit power	F = F0 ± 2 MHz	-	–52	-	dBm
	F = F0 ± 3 MHz	-	–58	-	dBm
	F = F0 ± > 3 MHz	-	–60	-	dBm
$\Delta f1_{avg}$	-	-	-	265	kHz
$\Delta f2_{max}$	-	247	-	-	kHz
$\Delta f2_{avg}/\Delta f1_{avg}$	-	-	–0.92	-	-
ICFT	-	-	–10	-	kHz
Drift rate	-	-	0.7	-	kHz/50 μs
Drift	-	-	2	-	kHz

5.6 Reflow Profile

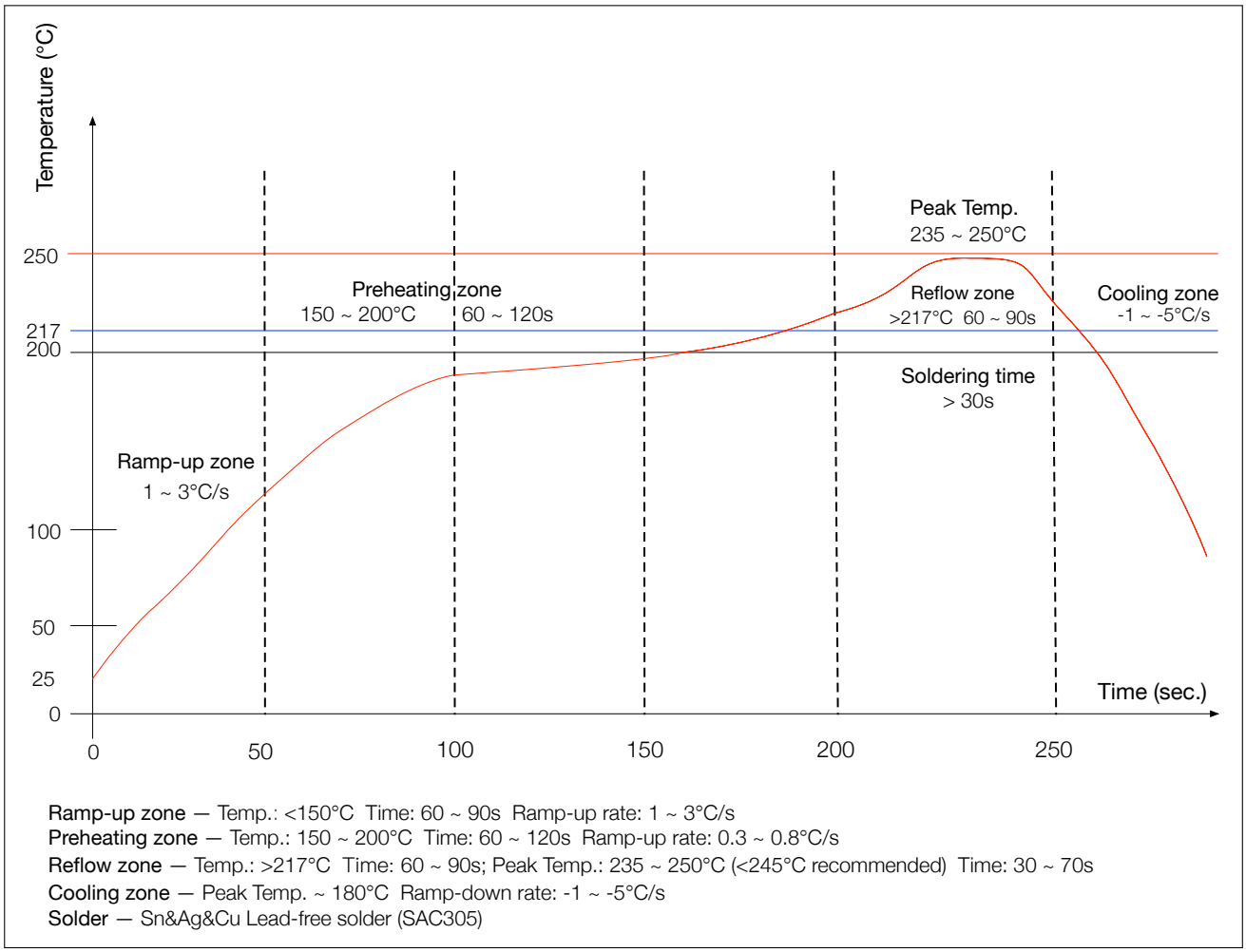


Figure 2: Reflow Profile

6. Schematics

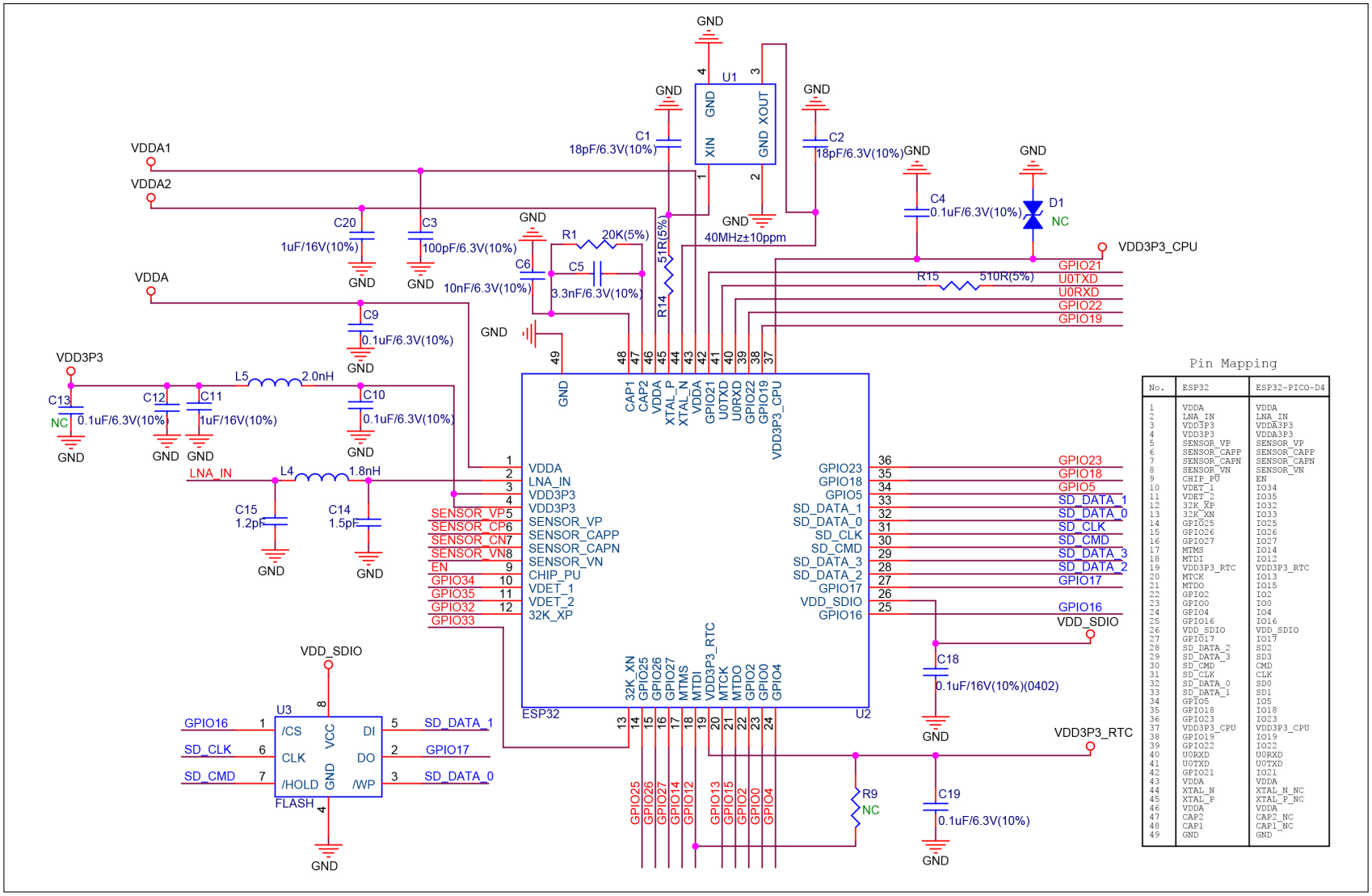


Figure 3: ESP32-PICO-D4 Module Schematics

7. Peripheral Schematics

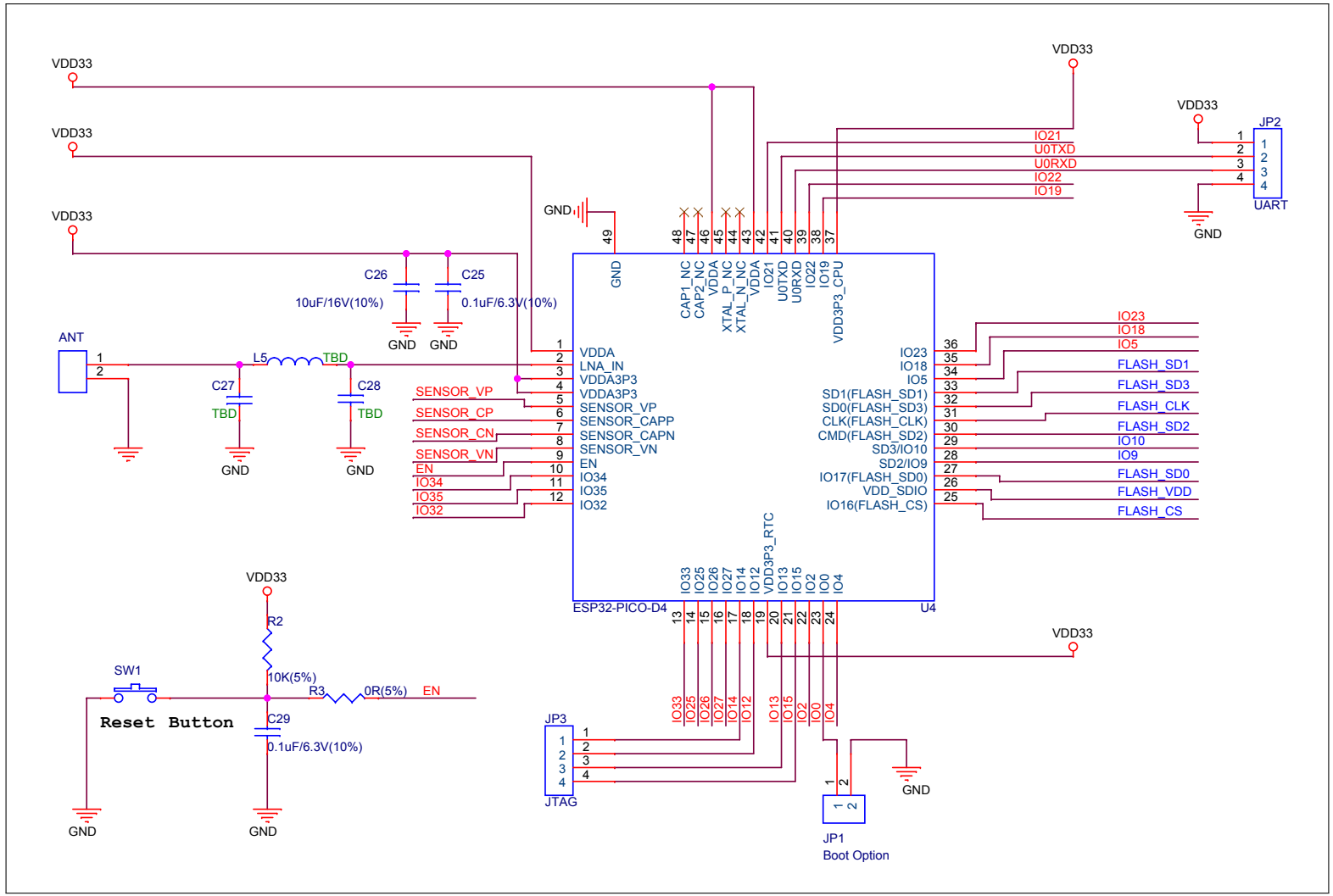
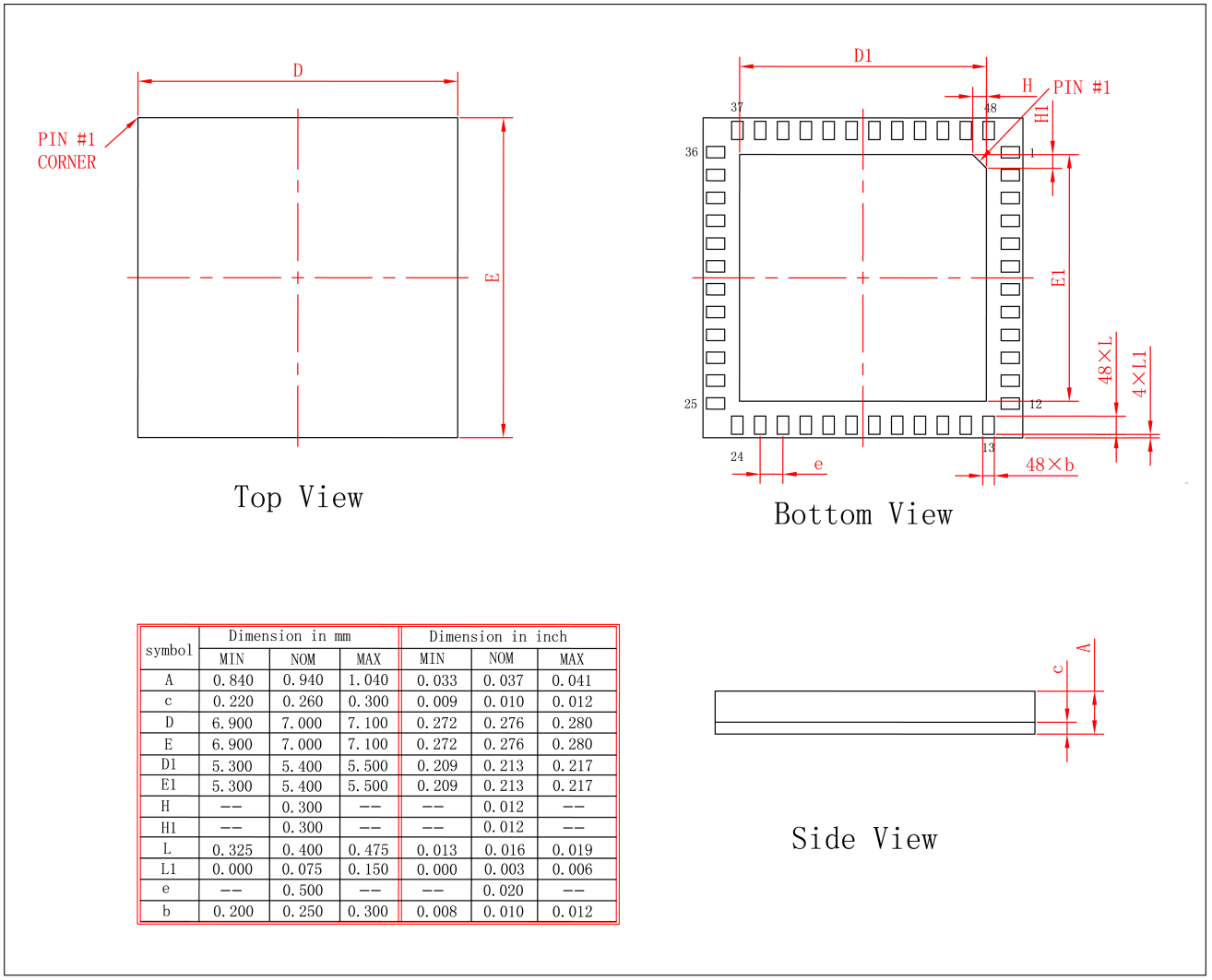


Figure 4: ESP32-PICO-D4 Module Peripheral Schematics

Note:

- When ESP32 is powered on and off repeatedly by switching the power rails, and there is a large capacitor on the VDDA3P3 rail, a discharge circuit can be added to the VDDA3P3 rail. Please find details in Chapter **Peripheral Schematics**, in *ESP32-WROOM-32 Datasheet*.
- When battery is used as the power supply for ESP32 series of chips and modules, a supply voltage supervisor is recommended to avoid boot failure due to low voltage. Users are recommended to pull CHIP_PU low if the power supply for ESP32 is below 2.3V. For the reset circuit, please refer to Chapter **Peripheral Schematics**, in *ESP32-WROOM-32 Datasheet*.

8. Package Information



symbol	Dimension in mm			Dimension in inch		
	MIN	NOM	MAX	MIN	NOM	MAX
A	0.840	0.940	1.040	0.033	0.037	0.041
c	0.220	0.260	0.300	0.009	0.010	0.012
D	6.900	7.000	7.100	0.272	0.276	0.280
E	6.900	7.000	7.100	0.272	0.276	0.280
D1	5.300	5.400	5.500	0.209	0.213	0.217
E1	5.300	5.400	5.500	0.209	0.213	0.217
H	--	0.300	--	--	0.012	--
H1	--	0.300	--	--	0.012	--
L	0.325	0.400	0.475	0.013	0.016	0.019
L1	0.000	0.075	0.150	0.000	0.003	0.006
e	--	0.500	--	--	0.020	--
b	0.200	0.250	0.300	0.008	0.010	0.012

Figure 5: ESP32-PICO-D4 Package

9. Learning Resources

9.1 Must-Read Documents

The following link provides documents related to ESP32.

- *ESP32 Datasheet*
  This document provides an introduction to the specifications of the ESP32 hardware, including overview, pin definitions, functional description, peripheral interface, electrical characteristics, etc.
- *ESP-IDF Programming Guide*
  It hosts extensive documentation for ESP-IDF ranging from hardware guides to API reference.
- *ESP32 Technical Reference Manual*
  The manual provides detailed information on how to use the ESP32 memory and peripherals.
- ESP32 Hardware Resources
  The zip files include the schematics, PCB layout, Gerber and BOM list of ESP32 modules and development boards.
- *ESP32 Hardware Design Guidelines*
  The guidelines outline recommended design practices when developing standalone or add-on systems based on the ESP32 series of products, including the ESP32 chip, the ESP32 modules and development boards.
- *ESP32 AT Instruction Set and Examples*
  This document introduces the ESP32 AT commands, explains how to use them, and provides examples of several common AT commands.
- *Espressif Products Ordering Information*

9.2 Must-Have Resources

Here are the ESP32-related must-have resources.

- ESP32 BBS
  This is an Engineer-to-Engineer (E2E) Community for ESP32 where you can post questions, share knowledge, explore ideas, and help solve problems with fellow engineers.
- ESP32 GitHub
  ESP32 development projects are freely distributed under Espressif's MIT license on GitHub. It is established to help developers get started with ESP32 and foster innovation and the growth of general knowledge about the hardware and software surrounding ESP32 devices.
- ESP32 Tools
  This is a webpage where users can download ESP32 Flash Download Tools and the zip file "ESP32 Certification and Test".
- ESP-IDF
  This webpage links users to the official IoT development framework for ESP32.
- ESP32 Resources
  This webpage provides the links to all available ESP32 documents, SDK and tools.

Revision History

Date	Version	Release notes
2018.06	V1.3	• Changed the voltage range of VDD3P3_RTC from 1.8-3.6V to 2.3-3.6V in Table 2: Pin Description; • Changed the voltage range of VDD_SDIO from "1.8V or the same voltage as VDD3P3_RTC" to "the same voltage as VDD3P3_RTC" in Table 2: Pin Description; • Deleted the content about temperature sensor and LNA pre-amplifier; • Updated Chapter 3: Functional Description; • Updated the note in Chapter 4: Peripherals and Sensors; • Deleted the note on pad49 and added two other notes in Chapter 7: Peripheral Schematics; Changes to electrical characteristics: • Updated Table 5: Absolute Maximum Ratings; • Added Table 6: Recommended Operating Conditions; • Added Table 7: DC Characteristics; • Updated the values of "Gain control step", "Adjacent channel transmit power" in Table 10: Transmitter Characteristics - BLE.
2018.03	V1.2	Updated the pin description of VDD_SDIO in Section 2.2; Updated the ESP32-PICO-D4 Pin Layout in Section 2.1; Updated the ESP32-PICO-D4 Module Schematics in Chapter 6; Updated the ESP32-PICO-D4 Module Peripheral Schematics in Chapter 7.
2017.09	V1.1	Operating voltage/power supply range updated to 2.7 ~ 3.6V; Added a note in Chapter 7.
2017.08	V1.0	First release.