

Espressif SoC Product Portfolio

Comprehensive Connectivity, AI and HMI SoCs



Product Selector

Feature	P-Series	S-Series			C-Series					H-Series			32-Series		
	ESP32-P4	ESP32-S3	ESP32-S31	ESP32-S2	ESP32-C5	ESP32-C6	ESP32-C61	ESP32-C3	ESP32-C2	ESP32-H4	ESP32-H2	ESP32-H21	ESP32		
Connectivity	Wi-Fi	Wi-Fi Generation	11b/g/n	11b/g/n/ax	11b/g/n	11a/b/g/n/ac/ax	11b/g/n/ax	11b/g/n/ax	11b/g/n	11b/g/n				11b/g/n	
		Data Rate	150 Mbps	150 Mbps	150 Mbps	150 Mbps	150 Mbps	150 Mbps	150 Mbps	72.2 Mbps				150 Mbps	
		Dual Band				✓									
		Wi-Fi 6			✓	✓	✓	✓							
		SoftAP		✓	✓	✓	✓	✓	✓	✓	✓			✓	
		Sniffing		✓	✓	✓	✓	✓	✓	✓	✓			✓	
		WPA Support		WPA3	WPA3	WPA3	WPA3	WPA3	WPA3	WPA3	WPA3				WPA 3
	Wi-Fi CSI		✓	✓	✓	✓	✓	✓	✓	✓				✓	
	Bluetooth	Bluetooth Low Energy		5.0	BT Classic/ 5.4	5.3	5.3	5.0	5.0	5.0	5.4	5.0	5.0	BT Classic / 4.2	
		LE-Audio			✓						✓				
		Direction Finding			✓						✓				
		Long Range		✓	✓		✓	✓	✓	✓	✓	✓	✓		
		2Mbps Data Rate		✓	✓		✓	✓	✓	✓	✓	✓	✓		
		Extended Advertising		✓	✓		✓	✓	✓	✓	✓	✓	✓		
BLE-Mesh			✓	✓		✓	✓	✓	✓	✓	✓	✓	✓		
Type	Thread			✓	✓	✓				✓	✓	✓			
	Zigbee			✓	✓	✓				✓	✓	✓			
	Matter		Wi-Fi	Wi-Fi, Thread		Wi-Fi, Thread	Wi-Fi, Thread	Wi-Fi	Wi-Fi	Wi-Fi	Thread	Thread	Thread	Wi-Fi	
	Ethernet	✓		✓									✓		
	SoC	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	Module		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	Radio	Frequency		2.4 GHz	2.4 GHz	2.4 GHz	2.4 GHz, 5 GHz	2.4 GHz	2.4 GHz	2.4 GHz	2.4 GHz	2.4 GHz	2.4 GHz	2.4 GHz	
Tx-Power		0 to 20 dBm	0 to 21 dBm	0 to 20 dBm	0 to 20 dBm	0 to 20 dBm	0 to 20 dBm	0 to 20 dBm	0 to 20 dBm	-15 to 6 dBm	-15 to 20 dBm	-15 to 20 dBm	0 to 20 dBm		
Rx-Sensitivity (dBm)		-98.4 (Wi-Fi-1M) -104 (BLE 125k)	U/T	-97 (Wi-Fi-1M)	-101 (Wi-Fi-1M) -99 (Wi-Fi 5G 6M) -107 (BLE 125k) -104 (802.15.4)	-99.2 (Wi-Fi-1M) -106 (BLE 125k) -104 (802.15.4)	-99.5 (Wi-Fi-1M) -105 (BLE 125k)	-98.4 (Wi-Fi-1M) -105 (BLE 125k)	-99 (Wi-Fi 1M) -106 (BLE 125k)	-(BLE-125k) -(802.15.4)	-(BLE-125k) -(802.15.4)	-106.5 (BLE-125k) -102.5 (802.15.4)	-98 (Wi-Fi-1M) -94 (BLE-1M)		
CPU & Memory	CPU	Dual Core RISC-V	Dual Core Xtensa	Dual Core RISC-V	Single Core Xtensa	Single Core RISC-V	Single Core RISC-V	Single Core RISC-V	Single Core RISC-V	Single Core RISC-V	Dual Core RISC-V	Single Core RISC-V	Single Core RISC-V	Single/Dual Core Xtensa	
	Clock	400MHz	240MHz	300MHz	240MHz	240MHz	160MHz	160MHz	160MHz	120MHz	96MHz	96MHz	96MHz	240MHz	
	FPU Extension	✓	✓	✓							✓			✓	
	AI Extensions	✓	✓	✓											
	LP CPU	40MHz RISC-V	17.5MHz RISC-V + ULP Core	ULP RISC-V	8MHz RISC-V + ULP Core	40MHz RISC-V	20MHz RISC-V							ULP Core	
	SRAM	768KB (HP) 16KB (LP)	512KB (HP) 16KB (LP)	512KB (HP) 32KB (LP)	320KB (HP) 16KB (LP)	384KB (HP) 16KB (LP)	512KB (HP) 16KB (LP)	320KB	400KB 8KB (RTC)	272KB	320KB	320KB 4KB (RTC)	320KB 4KB (RTC)	520KB 16KB (RTC)	
	External Flash	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Security	PSRAM Support	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
	Secure Boot	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
	Flash Encryption	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
	Crypto Accelerators														
	Digital Signature	RSA, AES, ECC, HMAC	RSA, AES, HMAC	RSA, AES, ECC, HMAC, TRNG	RSA, AES, HMAC	RSA, AES, ECC, HMAC	RSA, AES, ECC, HMAC	ECC, SHA	RSA, AES, HMAC	ECC, SHA	AES, ECC, HMAC	RSA, AES, ECC, HMAC	RSA, AES, ECC, HMAC	RSA, AES, SHA	
	APM/TEE	ECDSA, RSA	RSA	HCDSA, RSA	RSA	ECDSA, RSA	RSA	ECDSA	RSA		ECDSA	ECDSA	ECDSA		
	Key Manager	✓		✓							✓	✓	✓		
HMI	MIPI-CSI	2-lane													
	H.264 Encoder	1080p@30fps													
	MIPI-DSI	2-lane													
	RGB Display	✓	✓	✓	✓								✓		
	Camera Interface	✓	✓	✓	✓								✓		
	Touch Inputs	14	14	14	14						14			10	
Peripherals	GPIO Pins	55	45	60	43	29	30 or 22	22 or 18	22 or 16	14	35	19	19	34	
	SDIO Host	1	1	2										1	
	SDIO Slave			1		1	1	1						1	
	I3C	1													
	SPI	4x SPI 1x LP SPI	4	6xSPI 1xLP SPI	4	2x SPI 1x GP SPI	2x SPI 1x GP SPI	3	3	3	4	3	3	4	
	USB OTG	1xHS 1xFS	1x FS	1x HS	1x FS						1				
	USB Serial	1	1	1		1	1	1	1	1	1	1	1		
	CAN-FD/TWAI	3x TWAI	1x TWAI	2x TWAI	1x TWAI	2x CAN-FD	2x TWAI		1x TWAI		1x CAN-FD	1x TWAI	1x TWAI	1x TWAI	
	UART	5x UART 1x LP UART	3	4x UART 1x LP UART	2	2x UART 1x LP UART	2x UART 1x LP UART	3	2	2	2	2	2	3	
	I2C	2x I2C 2x LP I2C	2	2 x I2C 1x LP I2C	2	1x I2C 1x LP I2C	1x I2C 1x LP I2C	1	1	1	2	2	2	2	
	I2S	3x I2S 1x LP I2S	2	2 x I2S	1	1	1	1	1	1	1	1	1	2	
	PWM	1x LED 8ch 2x MCPWM 6ch	1x LED 8ch 2x MCPWM	2x LED 8ch 4x MCPWM	1x LED 8ch	1x LED 6ch 1x MCPWM 6ch	1x LED 6ch 1x MCPWM	1x LED 6ch	1x LED 6ch	1x LED 6ch	1x LED 6ch	1x LED 8ch 2x MCPWM	1x LED 6ch 1x MCPWM	1x LED 6ch 1x MCPWM	1x LED 16ch 2x MCPWM
	ADC	2x 12 bit	2x 12 bit	2x 12 bit	2x 13 bit 20ch	1x 12 bit 6ch	1x 12 bit 7ch	1x 12 bit	2x 12 bit 6ch	1x 12 bit 5ch	1x 12 bit	1x 12 bit 5ch	1x 12 bit 5ch	1x 12 bit 18ch	
	DAC			2 x 10bit 2 x 12bit	2x 8 bit									2x 8 bit	
	Timers, WDT	4x HP GPT, 1x ST, 3x HP WDT, 1x LPST, 1x LP GPT, 1x LP WDT, 1x ASWDT	4x GPT, 1x ST, 3x WDT	4x GPT, 1x ST, 3x WDT	1x GPT, 1x ST, 3x WDT, 1x SWDT, 2x XTAL32k WDT	1x ST, 2x GPT, 1x RTCT, 3x DWDT, 1x AWDT	1x ST, 2x GPT, 3x DWDT, 1x AWDT	2x GPT, 1x ST, 2x SWDT, 3x WDT	2x GPT, 3x DWDT, 1x AWDT, 1x ST	1x GPT, 2x WDT, 1x ST	2x GPT, 1x ST, 3x WDT	2x GPT, 1x ST, 3x WDT	2x GPT, 1x ST, 3x WDT	3x WDT, 4x GPT	
	Temp Sensor	1	1	1	1	1	1	1	1	1	1	1	1	1	
	Operating Temperature	-40 to 85	-40 to 105	-40 to 105	-40 to 105	-40 to 85	-40 to 105	-40 to 105	-40 to 105	-40 to 105	-40 to 105	-40 to 105	-40 to 105	-40 to 125	
	Supply Voltage	3.0 to 3.6	3.0 to 3.6	3.0 to 3.6	3.0 to 3.6	3.0 to 3.6	3.0 to 3.6	3.0 to 3.6	3.0 to 3.6	3.0 to 3.6	1.7 to 5.0	1.8 to 5.0	1.8 to 3.6	2.3/3.0 to 3.6	
	Package Type	QFN104	QFN56 LGA56	QFN80	QFN56	QFN48	QFN40 QFN32	QFN32 QFN28	QFN28 QFN32	QFN24	QFN52	QFN36	QFN32	QFN48 LGA48	