

TABLE OF BOARDS

Written by David Scheltema

The art of choosing a board is knowing when to go to the specs. Start with the general project idea. Make a list of the features the project requires. Then, and only then, jump into the specs to determine which board is right for your next project.

Depending on the application, certain specs will be more important than others. In a purely software project, board features such as the developer tools, memory, and clock speed will matter much more than the video output or board dimensions. For projects that measure environmental data specs such as radio connectivity, digital and analog I/O are far more important than clock speed.

As it turns out, specs lists and data-sheets distributed by manufacturers are not always intended to be technical references, so much as they are designed as marketing copy. In fact, compiling a list of boards that compares similar features is not easy. With considerable research, we've put together the following spec sheet, but it's far from a complete technical reference.

The boards listed here are just a sample of what is available on the market now. We've made sure to include the most popular and interesting options; for even more, visit makezine.com/comparison/boards.

Finally, a request: Board manufacturers and vendors alike should aim to provide clear, standardized specs for the good of the community. Just as open source hardware and software inform and enable a stronger community, a concise list of easily accessible data points about a boards — and products in general — makes everyone better off. 🍌

Board Name	Price	Size	Type (microcontroller, single board computer, FPGA)	Software		Ethernet Ports	I/O Digital	I/O Analog	Memory	Website
Arduino Mega	\$46	4in×2.1in	MCU	Arduino		–	16 (2 PWM)	3	16MB flash, microSD	seedstudio.com
Arduino Uno	\$25	2.7in×2.1in	MCU	Arduino		–	30 (20 PWM)	16	1024KB flash, microSD	micropython.org
Arduino Yun	\$69	2.7in×2.1in	MCU	Arduino		Yes, GB	8 GPIO, I2C, I2S Audio, 2 UART, SPI (2 PWM)	–	8MB SPI Flash, microSD	minnowboard.org
Arduino Zero	\$50	2.7in×2.1in	MCU	Arduino		–	22 (6 PWM)	6	384KB flash	netduino.com
Arrow SmartEverything	\$118	2.1in×2.7in	MCU	Arduino		–	30 (15 PWM)	12 ADC, 2 DAC	1MB flash	particle.io
Banana Pi	\$65	3.6in×2.4in	SBC	Linux		–	18 (PWM 9)	8 ADC, 2 DAC	1MB flash	particle.io
Bare Conductive Touch Board	\$80	3.3in×2.4in	MCU	Arduino		Yes	14 GPIO	6	microSD	linksprite.com
BeagleBone Black	\$55	3.4in×2.1in	SBC	Debian Linux		–	18	4 ADC, 2 DAC	microSD	parallax.com
BeagleBone-X15	\$239	4in×4.2in	SBC	Debian Linux		Yes	26 GPIO	–	microSD	raspberrypi.org
RedBear Blend	\$33	2.9in×2.1in	MCU	Arduino		–	26 GPIO	–	microSD	raspberrypi.org
C.H.I.P.	\$9	1.5in×2.3in	SBC	Linux		–	16 (1 PWM)	2	5MB flash	seedstudio.com
DFRobot Leonardo with Xbee socket	\$20	2.8in×2.2in	MCU	Arduino		–	7 (Software PWM)	–	128KB Flash	rdduino.com
ESP8266	\$3-7	1.4in×1in	MCU	Arduino, Lua, AT-commands		Yes	40 (3 PWM)	–	4GB eMMC, SD, & microSD	riotboard.org
Espruino	\$40	2.1in×1.6in	MCU	Espruino JavaScript Interpreter		–	33x GPIO, 4x I2C audio, 14x I2C, 1x ADC, 2x DAC	16	microSD	krkkl.com
Flora	\$20	1.8in dia.	MCU	Arduino		–	34 (12 PWM)	21	256KB	pjrc.com
Gemma	\$10	1.1in dia.	MCU	Arduino		–	8 (2 PWM)	4	32KB flash	tiny-circuits.com
Intel Edison with Arduino Breakout	\$70	1.4in×1in	SBC	Poky Linux, Arduino		–	5 GPIO (2 shared w/USB 3 PWM)	3	8K flash	adafruit.com
Jetson TK1	\$192	5in×5in	SBC	Linux		yes	32 (8 PWM)	6	microSD	udoo.org
Kinoma Create	\$150	5.13in×5.2in	SBC	Custom Linux, Kinoma Studio IDE		–	25 (4 PWM)	3	2MB flash	wipy.io
LightBlue Bean	\$30	1.8in×0.8in	MCU	Arduino		–	20 (7 PWM)	12	32KB flash	seedstudio.com

EXPANSION BOARDS!

Written by Kipp Bradford

CALLED HATS, CAPES, AND SHIELDS, THESE ADD-ON UNITS CAN TAKE YOUR BOARD PROJECT TO THE NEXT LEVEL

● **MOTOR** boards control hobby servos as well as stepper, brushed, and brushless DC motors. Available for everything from small pager motors to units rated one horsepower or more.

● **DISPLAY** boards may control a small text or graphic LCD display directly, or they can generate video signals for HDMI, VGA, and old-school composite monitors.

● **AUDIO** boards convert signals from a microphone or audio input into digital data, as well as change digital data into audio waveforms for output.

● **PROTOTYPING** boards let you permanently connect wires and components to a project.

● **PHYSICAL INTERFACE** boards offer general combinations of inputs like joysticks, pushbuttons, or knobs. On the output side, mechanical or electrical relays are pretty typical.

● **STORAGE** boards typically have flash memory, often in the form of card slots for SD or microSD cards. Useful for logging data or playing back audio and video to a display.

● **SENSING AND MEASURING** boards can measure light, sound, temperature, air pressure, acceleration, rotation, position (GPS), and more.

● **COMMUNICATION** boards offer Wi-Fi, Ethernet, Bluetooth, cellular, CAN, USB, XBee, RFID, 1-Wire, etc. 🍌

Board Name	Price	Size	Type (microcontroller, single board computer, FPGA)	Software	Operating Voltage (tolerance range)	Clock Speed	Radio	Video		Operating Voltage (tolerance range)	Clock Speed	Radio	Video	Ethernet Ports	I/O Digital	I/O Analog	Memory	Website
LinkIt One	\$59	3.3in×2.1in	MCU	Arduino	3.7V–4.2V	260MHz	Wi-Fi, Bluetooth	–		6V–20V	16MHz	–	–	–	54 (15 PWM)	16	256KB flash	arduino.cc
MicroPython pyboard	\$42	1.7in×1.66in	MCU	MicroPython	3.6V–16V	168MHz	Wi-Fi	–		6V–20V	16MHz	–	–	–	14 (6 PWM)	6	32KB flash	arduino.cc
MinnowBoard Max	\$145	2.9in×3.9in	SBC	Linux	5V	Dual-core 1.33GHz	–	Micro-HDMI		5V	16MHz & 400MHz	Wi-Fi	–	–	20 (7 PWM)	12	32KB flash	arduino.cc
Netduino 3	\$70	3.3in×2.1in	MCU	.NET Micro Framework 4.3	7.5V–12V	168MHz	–	–		7V–12V	48MHz	–	–	–	20 (18 PWM)	6 in, 1 out	256KB flash	arduino.cc
Particle Electron	\$39 (2G) / \$59 (3G)	2.0in×0.8in	MCU	Arduino	3.3V	120MHz	Cellular	–		5V–45V	48MHz	SigFox, Bluetooth	–	–	14	6	256KB	smartereverything.it
Particle Photon	\$19	1.44in×0.8in	MCU	Arduino	3.3V	120MHz	Wi-Fi	–		5V	1GHz	–	HDMI	Yes	26	–	SD	bananapi.org
pcDuino Acadia	\$120	4.7in×2.6in	SBC	Linux	5V	Quad-core 1.2GHz	–	HDMI		5V	16MHz	–	–	–	20 (7 PWM)	12	32KB flash, microSD	bareconductive.com
Propeller Activity Board	\$50	4.0in×3.05in	MCU	SimpleIDE, Propeller Tool	6V–9V	Octo-core 80MHz	XBee Ready	Composite		5V	1GHz	–	Micro-HDMI	Yes	65 (8 PWM)	7	4GB eMMC	beagleboard.org
Raspberry Pi 2	\$40	3.4in×2.2in	SBC	Linux	5V	Quad-core 900MHz	–	HDMI		12V	Dual-core 1.5GHz	–	HDMI	Yes, GB	157	–	4GB 8-bit eMMC	beagleboard.org
Raspberry Pi Zero	\$5	1.18in×2.56in	SBC	Linux	5V	1GHz	–	HDMI Mini		6.5V–12V	16MHz	Bluetooth	–	–	14 (PWM 5)	6	32K flash	redbearlab.com
RePhone	\$59	1in×0.8in	MCU	Arduino	3.3V–4.2V	260MHz	–	TFT display		3.7V–5V	1GHz	Wi-Fi, Bluetooth	Composite via TRRS jack	–	8 GPIO, SPI, I2C, UART, CSI, Parallel LCD	1	4GB eMMC	getchip.com
RFduino	\$29	0.9in×1.514in	MCU	Arduino	2.1V–3.6V	16MHz	Wi-Fi, Bluetooth	–		7V–12V	16MHz	Wi-Fi, Bluetooth	–	–	20 (7 PWM)	12	32KB flash	dfrobot.com
RioTBoard	\$79	3in×4.7in	SBC	Linux, Android	5V	1GHz	–	HDMI, LVDS, LCD		3V–3.6V	80MHz	Wi-Fi	–	–	2	1	1MB	espressif.com
Snickerdoodle	\$55	2in×3.5in	FPGA	Linux	3.7V–17V	Dual-core 667MHz	Bluetooth	–		1.6V–15V	72MHz	–	–	–	44 (26 PWM)	16 ADC, 2 DAC	256KB flash	espruino.com
Teensy 3.2	\$20	1.4in×0.7in	MCU	Teensyduino	3.3V	72MHz	–	–		3.5V–16V	8MHz	–	–	–	8 (3 PWM)	4	32KB flash	adafruit.com
TinyLily Mini	\$10	0.55in dia.	MCU	Arduino	2.7V–5.5V	8MHz	–	–		4V–16V	8MHz	–	–	–	3 (2 PWM)	1	8KB flash	adafruit.com
Trinket 3.3V & 5V	\$7	1.1in×0.6in	MCU	Arduino	3.3V–16V	3.3V @ 8MHz, 5V @ 8MHz or 16MHz	–	–		7V–15V	Dual-core 500MHz	Wi-Fi, Bluetooth	–	–	20 (4 PWM)	6	4GB eMMC flash	intel.com
UD00 Neo Full	\$65	3.5in×2.3in	SBC	Linux	6V–15V	1GHz	Wi-Fi, Bluetooth	Micro-HDMI		12V	Quad-core 2.32GHz	–	HDMI	Gigabit	125 pins (7GPIO)	–	16GB eMMC, SD	nvidia.com
WiPy	\$32	1.7in×1in	MCU	MicroPython (Python 3.4 Syntax)	3.6V–5.5V	80MHz	Wi-Fi	–		3.7V	800MHz	Wi-Fi, Bluetooth	Built-in touchscreen	–	66 (3 PWM)	17	microSD	kinoma.com
Xadow	\$130 (kit)	1in×0.81in	MCU	Arduino	3.3V	16MHz	–	–		3V	8MHz	Bluetooth	–	–	6 (PWM 4)	2	32KB flash	punchthrough.com