SUPPORTING INFORMATION

Elevating Chemistry Research with a Modern Electronics Toolkit

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Table S1. Specifications of selected popular MCBs applicable in research related to chemistry. (These specifications are provided for reference only. For accurate and up-to-date specifications, please refer to the manufacturers' websites.)

MCB[a]	Picture (alphabet in Figure 2)	Chip	Processor	Pins			ADC resolution (bit)	Communication interfaces	Memory			Other features	Dimensions (l × w, mm)	Software	Compatible computer languages[b]	Website
				GPIO	Analog inputs	PWM			RAM	EEPROM	Flash					
Arduino Uno Rev 3	a	ATmega328P	16 MHz, 8 bit	14	6	6	10	TX/RX, I^2C, SPI, USB	2.0 kB	1 kB	32 kB	NA	68.6 × 53.4	Arduino IDE	C++	1
Arduino Leonardo	b	ATmega32U4	16 MHz, 8 bit	20	12	7	10	TX/RX, I^2C, SPI, USB	2.5 kB	1 kB	32 kB	NA	68.6 × 53.3	Arduino IDE	C++	2
Arduino 101	c	Intel Curie	32 MHz, 32 bit	14	6	4	10	TX/RX, I^2C, SPI, USB, Bluetooth	24.0 kB	NA	196 kB	six-axis accelerometer, gyroscope	68.6 × 53.4	Arduino IDE	C++	3
Arduino Due	d	AT91SAM3X8E	84 MHz, 32 bit	54	12	12	12	TX/RX (×4), I^2C (×2), SPI, USB	96.0 kB	NA	512 kB	analog output ×2 (12 bit)	101.5 × 53.3	Arduino IDE	C++	4
Arduino MKR1000	e	ATSAMW25	48 MHz, 32 bit	8	7	12	8, 10, 12	TX/RX, I^2C, SPI, USB, Wi-Fi	32.0 kB	NA	256 kB	analog output ×1 (10 bit), battery connector	61.5 × 25.0	Arduino IDE	C++	5
Arduino Micro	f	ATmega32U4	16 MHz, 8 bit	20	12	7	10	TX/RX, I^2C, SPI, USB	2.5 kB	1 Kb	32 kB	NA	48.0 × 18.0	Arduino IDE	C++	6
Arduino Nano	g	ATmega328P	16 MHz, 8 bit	22	8	6	10	TX/RX, I^2C, SPI, USB	2.0 kB	1 kB	32 kB	NA	45.0 × 18.0	Arduino IDE	C++	7
Adafruit Huzzah ESP8266 Breakout	h	ESP8266	80 MHz, 32 bit	9	1	NA	10	TX/RX, I^2C, SPI, Wi-Fi	64.0 kB (instruction) 96.0 kB (data)	NA	4 MB	MicroPython	37.0 × 25.0	Arduino IDE, PuTTY, embedXcode	C++, Python	8
Adafruit Pro Trinket	i	ATmega328P	16 MHz, 8 bit	18	6	6	10	TX/RX, I^2C, SPI, USB	2.0 kB	1 kB	28 kB	available in 3.3-V and 5.0-V logic levels	38.0 × 18.0	Arduino IDE	C++	9
Adafruit Trinket	j	ATtiny85	16 MHz, 8 bit	5	3	3	10	I^2C, SPI, USB	512.0 B	512 B	8 kB	available in 3.3-V and 5.0-V logic levels	31.0 × 15.5	Arduino IDE	C++	10
Adafruit ItsyBitsy M0 Express	NA	ATSAMD21G18	48 MHz, 32 bit	14	11	13	12	TX/RX, I^2C, SPI, USB	32.0 kB	NA	256 kB	analog output ×1 (10 bit), capacitive touch pin ×7, CircuitPython	36.0 × 17.8	Arduino IDE, Mu Editor,	C++, Python	11
chipKIT uC32	k	PIC32MX340F512	80 MHz, 32 bit	42	12	5	10	TX/RX (×2), I^2C (×2), SPI (×2), USB	32.0 kB	NA	512 kB	compatible with Arduino shields	68.6 × 53.4	Arduino IDE, MPIDE, MPLAB X IDE	C++	12
chipKIT Max32	l	PIC32MX795F512	80 MHz, 32 BIT	83	16	5	10	TX/RX (×4), I^2C (×5), SPI (×4), USB, Ethernet, CAN (×2)	128.0 kB	NA	512 kB	compatible with Arduino shields	101.5 × 53.4	Arduino IDE, MPIDE, MPLAB X IDE	C++	13
4duino-24	NA	ATmega32U4	16 MHz, 8 bit	20	12	7	10	TX/RX, I^2C, SPI, USB, Wi-Fi	2.5 kB	1 kB	32 kB	2.4" Intelligent LCD-TFT display, microSD card slot	72.8 × 53.3	Arduino IDE, Workshop4 IDE	C++, 4DGL	14
ARM7 Stick - LPC2148 - rhydoLABZ	NA	LPC2148	60 MHz, 16/32 bit	45	2	6	10	TX/RX (×2), I^2C (×2), SPI (×2), USB	40 kB	NA	512 Kb	analog output ×1 (10 bit)	64.5 × 31.5	Keil MDK-ARM, Flash Magic	C, C++	15
BBC micro:bit	p	nRF51822	16 MHz, 32 bit	19	6	18	10	I^2C, SPI, USB, Bluetooth, radio	16 kB	NA	256 kB	LED array (5 × 5), compass,	50.0 × 40.0	MakeCode Editor,	C++, Python, JavaScript	16

												three-axis accelerometer, battery connector, programmable pushbutton ×2, capacitive touch pin ×3, light and temperature sensor		Python Editor, Mbed online compiler		
Espruino Pico	t	STM32F401CDU6	84 MHz, 32 bit	22	9	21	12	TX/RX (×2), I^2C (×3), SPI (×3), USB	96 kB	NA	384 kB	On-board USB Type A connector	33.0 × 15.0	Espruino web IDE, Espruino Command-line tool	JavaScript	17
mbed HRM1017	NA	nRF51822	16 MHz, 32 bit	29	6	NA	10	TX/RX, I^2C, SPI (×2), USB, Bluetooth, radio	16 kB	NA	256 kB	NA	ND	Mbed online compiler, Mbed Studio, Mbed CLI	C++	18
MicroPython Pyboard	u	STM32F767VIT	216 MHz, 32 bit	24	16	NA	12	TX/RX (×4), I^2C (×2), SPI (×2), USB, Bluetooth, Wi-Fi, CAN	512 kB	NA	2 MB (internal), 2 MB (external QSPI ×2)	analog output ×2 (12 bit), microSD card slot	33.5 × 23.8	PuTTY, uPyCraft IDE	Python	19
Netduino 3 Wi-Fi	NA	Cortex-M4	168 MHz, 32 bit	22	6	6	12	TX/RX (×4), I^2C, SPI, USB, Wi-Fi	164 kB	NA	1408 kB	compatible with Arduino shields, microSD card slot	80.3 × 53.6	Microsoft Visual Studio	C#, Visual Basic .NET	20
NXP FRDM-K64F	NA	MK64FN1M0VLL12	120 MHz, 32 bit	16	6	12	16	UART (×5), I^2C (×2), SPI (×2), USB, Ethernet, CAN	256 kB	NA	1024 kB	analog output, microSD card slot	81.0 × 53.0	Mbed online compiler, Mbed Studio, Mbed CLI	C++	21
Paperduino	NA	ATmega168	16 MHz, 8 bit	20	6	6	10	TX/RX, FTDI-USB	1 kB	512 kB	16 kB	cardboard based	81.0 × 55.0	Arduino IDE	C++	22
Parallax Basic Stamp BS2 Rev K	w	PIC16C57c	20 MHz, 8 bit	16	NA	16	NA	TX/RX	32 B	2 kB	NA	capable of measuring resistance/capacitance based sensors	30.0 × 16.0	Parallax web IDE, Basic Stamp Editor	PBASIC	23
Parallax Propeller Activity Board	r	P8X32A-Q44	5 MHz, 8 cores	16	4	NA	12	USB, Wi-Fi	NA	64 kB	NA	analog output ×2 (12 bit), on-board breadboard, microSD card slot, Mini TRRS audio/video jack, Xbee RF module socket	101.6 × 77.5	SimpleIDE	C	24
Particle Argon	m	nRF52840	64 MHz, 32 bit	20	6	8	12	TX/RX, I^2C, SPI, USB, Wi-Fi, Bluetooth, NFC	256 kB	NA	1 MB (main) 4 MB (ESP32)	battery connector	50.8 × 22.9	Particle Build (web IDE), Desktop IDE (Dev), Particle CLI	C, C++	25

Particle Photon	n	STM32F205RGY6	120 MHz, 32 bit	18	8	9	12	TX/RX, I^2C, SPI (×2), USB, Wi-Fi, CAN	128 kB	NA	1 MB	analog output ×2	38.5 × 20.3	Particle Build (web IDE), Desktop IDE (Dev), Particle CLI	C, C++	26
Pololu A-Star 32U4 Mini SV	NA	ATmega32U4	16 MHz, 8 bit	26	12	7	10	TX/RX, I^2C, SPI (×2), USB	2.5 kB	1 kB	32 kB	NA	49.5 × 17.8	Arduino IDE	C++	27
Pololu Wixel	NA	CC2511F32	2.4 GHz Radio Transceiver	15	6	7	12	TX/RX (×2), SPI (×2), USB, Radio	4 kB	NA	29 kB	NA	38.1 × 17.8	Wixel SDK	C	28
RBBB (Really Bare Bones Board)	NA	ATmega328	16 MHz, 8 bit	22	8	6	10	TX/RX, I^2C, SPI, USB	2.0 kB	1 kB	32 kB	NA	76.2 × 25.4	Arduino IDE	C++	29
Seeed Xadow Main Board	v	ATmega32U4	16 MHz, 8 bit	20	12	7	10	TX/RX, I^2C, SPI, USB	2.5 kB	1 kB	32 kB	battery connector	25.4 × 20.4	Arduino IDE	C++	30
Seeeduino V4.2	NA	ATmega328P	16 MHz, 8 bit	14	6	6	10	TX/RX (×2), I^2C (×3), SPI, USB	2.0 kB	1 kB	32 kB	compatible with Arduino shields	115.0 × 78.0	Arduino IDE	C++	31
Sony Spresense	NA	CXD5602	156 MHz, 6 cores	17	2	NA	10	TX/RX, I^2C, SPI, USB, Wi-Fi, Bluetooth, LTE	1.5 MB	NA	8 MB	camera connector, camera and extension boards are available separately	50.0 × 20.6	Arduino IDE, Spresense SDK	C++	32
Teensy 3.2	o	MK20DX256VLH7	72 MHz, 32 bit	34	21	12	16	TX/RX (×3), I^2C (×2), SPI, USB, CAN	65 kB	2 kB	262 kB	analog output (12 bit), capacitive touch pin ×12	35.6 × 17.8	Arduino IDE (with Teensyduino)	C++	33
Thunderboard Sense 2	NA	EFR32MG12	40 MHz, 32 bit	16	2	4	12	TX/RX, I^2C (×2), SPI, USB, radio	256 kB	NA	1 MB	coin cell holder, external battery connector, Relative Humidity and Temperature Sensor, UV and Ambient Light Sensor, Pressure Sensor, Indoor Air Quality and Gas Sensor, 6-axis Inertial Sensor, Digital Microphone, Hall-effect Sensor	45.0 × 30.0	Simplicity Studio, Bluetooth SDK, Thunderboard mobile app	C++	34
TinyPico	NA	ESP32 Pico-D4	240 MHz, 32 bit	14	8	14	12	I^2C, SPI, USB, Wi-Fi, Bluetooth	4 MB	NA	4 MB	analog output ×2, capacitive touch pin ×6, MicroPython	18.0 × 32.0	Arduino IDE, PuTTY, Espressif IoT Development Framework,	C++, Python	35

[a]Other brands/examples include: Adafruit Clue, Adafruit Feather, Calliope Mini, Circuit Playground Express, EasyPIC v8, Espressif, Espruino Original, Explore Labs ESP8266 WiFi Internet of Things (IoT) Breakout, GNSS 7 Click, iBoard Lite, JoC Module, LPC55S69-EVK, LPCXpresso Board for LPC1104, L-Tek FF-LPC546xx, Maixduino, Maxim Integrated, Microchip AC164160 Secure IoT Sensor Node, Microchip AC164165 Wi-Fi Smart Device Enablement Kit, Microchip PIC-IoT WG, Microchip PIC18F57Q43 Curiosity Nano Evaluation Kit, Microduino, Mikromedia for PIC18FJ, MINI-AT Board, NodeMCU, Nordic Semiconductor nRF52840 DK, PIC Clicker, Renesas RX65N Cloud Kit, Silicon Labs Thunderboard Sense 2 Sensor-to-Cloud Advanced IoT Development Kit, STM32 Nucleo-L031K6, WiMODino.

[b]Arduino boards and some other MCBs use an adaptation of C++ (a derivative of Processing and Wiring projects).

Table S2. Specifications of selected popular SBCs applicable in research related to chemistry. (These specifications are provided for reference only. For accurate and up-to-date specifications, please refer to the manufacturers' websites.)

SBCs (including COMs and SOMs)[a]	Picture (alphabet in Figure 2)	Chip	Processor	Pins	Communication interfaces	Memory		Other features	Dimensions (l × w, mm)	OS	Compatible computer languages	Website
						RAM	Flash					
Raspberry Pi 3 Model A+	a	BCM2837B0	1.4 GHz, 64 bit	GPIO (×28), PWM (×4)	TX/RX, I^2C, SPI, USB, USB 2.0, Wi-Fi, Bluetooth	512 MB	NA	full-size HDMI, camera corrector, touch display connector, microSD card slot	65.0 × 56.5	Raspbian, Windows 10 IoT Core (among others)	Python, C, C++, JavaScript, Ruby, Scratch, Perl	36
Raspberry Pi 3 Model B	b	BCM2837	1.2 GHz, 64 bit	GPIO (×28), PWM (×4)	TX/RX, I^2C, SPI, USB, USB 2.0 (×4), Wi-Fi, Bluetooth, Ethernet	1 GB	NA	full-size HDMI, camera corrector, touch display connector, microSD card slot	85.0 × 56.0	Raspbian, Windows 10 IoT Core (among others)	Python, C, C++, JavaScript, Ruby, Scratch, Perl	37
Raspberry Pi 3 Model B+	c	BCM2837B0	1.4 GHz, 64 bit	GPIO (×28), PWM (×4)	TX/RX, I^2C, SPI, USB, USB 2.0 (×4), Wi-Fi, Bluetooth, Ethernet	1 GB	NA	full-size HDMI, camera corrector, touch display connector, microSD card slot	85.6 × 56.5	Raspbian, Windows 10 IoT Core (among others)	Python, C, C++, JavaScript, Ruby, Scratch, Perl	38
Raspberry Pi 4 Model B	d	BCM2711	1.5 GHz, 64 bit	GPIO (×28), PWM (×4)	TX/RX, I^2C, SPI, USB, USB 2.0 (×2), USB 3.0 (×2), Wi-Fi, Bluetooth, Ethernet	1/2/4 GB	NA	micro-HDMI (×2), camera corrector, touch display connector, microSD card slot	85.6 × 56.5	Raspbian, Windows 10 IoT Core (among others)	Python, C, C++, JavaScript, Ruby, Scratch, Perl	39
BeagleBone Black	e	AM3358BZCZ100	1.0 GHz, 32 bit	GPIO (×65), PWM (×8), timer (×4), analog input (×7)	TX/RX (×4), I^2C (×2), SPI (×2), USB, USB 2.0, Ethernet	512 MB	4 GB	micro-HDMI, microSD card slot	86.4 × 53.3	Debian, Android, Ubuntu (among others)	Python, C, C++, JavaScript, Ruby, Perl	40
BeagleBone Black Wireless	f	OSD3358	1.0 GHz, 32 bit	GPIO (×65), PWM (×8), timer (×4), analog input (×7)	TX/RX (×4), I^2C (×2), SPI (×2), USB, USB 2.0, Wi-Fi, Bluetooth	512 MB	4 GB	micro-HDMI, microSD card slot	86.4 × 53.3	Debian, Android, Ubuntu (among others)	Python, C, C++, JavaScript, Ruby, Perl	41
Asus Tinker Board S	g	RK3288	1.8 GHz, 32 bit	GPIO (×28), PWM (×2)	TX/RX (×4), I^2C (×2), SPI (×2), USB 2.0 (×4), Ethernet, Wi-Fi, Bluetooth	2 GB	16 GB	full-size HDMI, microSD card slot	85.4 × 54.0	TinkerOS (Debian-based), Android, Ubuntu (among others)	Python, Squeak, Scratch	42
NanoPC-T3 Plus	h	S5P6818	1.4 GHz, 64 bit	GPIO (×26), PWM (×3)	TX/RX (×4), I^2C, SPI, USB, USB 2.0 (×4), Ethernet, Wi-Fi, Bluetooth	2 GB	16 GB	full-size HDMI, microSD card slot, camera corrector, LCD display connector, RTC battery connector	100.0 × 64.0	FriendlyCore, Lubuntu, Android (among others)	Python, C, C++, JavaScript, Ruby, Perl	43
Intel Edison compute module	i	Intel Atom	500 MHz, 32 bit	GPIO (×20), PWM (×4), analog input (×6)	TX/RX, I^2C, SPI, USB, USB 2.0, Wi-Fi, Bluetooth	1 GB	4 GB	microSD card slot, Arduino expansion board	35.5 × 25.0 (only compute module)	Yocto Linux, Arduino IDE, Intel XDK	Python, C, C++, JavaScript	44
Onion Omega 2+	j	MT7688	580 MHz	GPIO (×18), PWM (×2)	TX/RX (×2), I^2C, SPI, USB, USB 2.0, Wi-Fi	128 MB	32 MB	microSD card slot, ADC expansion board	42.9 × 26.4 (only compute module)	Linux (Onion-customized)	Python, C, C++, Ruby, Perl, JavaScript	45
NanoPi Duo2	k	Allwinner H3	1.2 GHz, quad-core	GPIO (×12), PWM	TX/RX (×2), I^2C, SPI, USB, USB 2.0, Ethernet, Wi-Fi, Bluetooth	512 MB	NA	microSD card slot, camera connector, IoT-Box Carrier Board	55.0 × 25.4 (only main board)	FriendlyCore, OpenWrt, U-boot, Linux-4.14, Ubuntu	Python, C, C++, JavaScript	46

CHIP	l	Allwinner R8	1.0 GHz, 32 bit	GPIO (×8), PWM, analog temperature sensor input, analog input	TX/RX, I^2C (×2), USB, USB 2.0, Wi-Fi, Bluetooth	512 MB	4 GB	battery connector, TRRS audio/video connector, camera connector, resistive touchscreen connector	60.5 × 41.0	CHIP OS (Linux-Debian-based)	Python, C, C++, JavaScript, Ruby, Squeak, Assembly, ArnoldC, BF, PHP	47
LattePanda	m	Intel Atom x5-Z8350	1.92 GHz, quad-core	GPIO (×26), PWM (×6), analog input (×12)	TX/RX, I^2C, SPI, USB 2.0 (×2), USB 3.0, Ethernet, Wi-Fi, Bluetooth	4 GB	64 GB	full-size HDMI, microSD card slot, LCD display connector, plug and play sensor connector (×6), resistive touchscreen connector	88.0 × 70.0	Windows 10	Python, C, C++, JavaScript	48
Toradex Colibri T30	n	NVIDIA Tegra 3	1.4 GHz, quad-core	GPIO (×158), PWM (×4), analog input (×4)	TX/RX (×5), I^2C (×4), SPI (×6), USB, USB 2.0, Ethernet	1 GB	4 GB	full-size HDMI, microSD card slot, resistive touchscreen connector, VGA, camera connector	67.6 × 36.7 (only compute module)	Windows Embedded Compact, Embedded Linux, Android	Python, C, C++, JavaScript	49
Parallella Board P1601	o	Zynq-Z7010 (including FPGA and Arm A9) and 16-core Epiphany coprocessor	Arm: 1.0 GHz, dual-core; FPGA: 28K logic cells	GPIO (×48), analog input	TX/RX, I^2C, USB, USB 2.0, Ethernet	1 GB	128 MB	micro-HDMI, microSD card slot	87.0 × 54.0	Linux (Ubuntu)	Python, C, C++ (among others)	50
Google Coral Dev Board	p	NXP i.MX 8M (quad Cortex-A53, Cortex-M4F) and Google Edge TPU coprocessor	Arm: 1.5 GHz, 64 bit	GPIO (×16), PWM (×4)	TX/RX (×2), I^2C (×2), SPI (×2), USB serial console, USB Type-C OTG, USB 3.0, Ethernet, Wi-Fi, Bluetooth	1 GB	8 GB	full-size HDMI, microSD card slot, camera connector, display serial interface	88.1 × 59.9	Linux (Mendel)	Python	51
HardKernel Odroid-C2	NA	Amlogic S905	1.5 GHz, 64 bit	GPIO (×19), PWM (×2), analog input (×2)	TX/RX, I^2C (×2), USB 2.0 OTG, USB 2.0 (×4), Ethernet, IR receiver	2 GB	NA	full-size HDMI, microSD card slot, eMMC 5.0 flash storage slot,	85.0 × 56.0	Linux (Ubuntu), Android	Python, C, C++, JavaScript	52
UP[2]	q	Intel Celeron N3550 / Intel Pentium N4200 / Intel Atom x7-E3950	Intel Pentium N4200: 2.5 GHz	GPIO (×28), PWM (×3)	TX/RX (×2), I^2C (×2), SPI (×2), USB 3.0 OTG, USB 3.0 (×3), Ethernet (×2), Serial ATA.	2GB / 4GB / 8GB	32 GB / 64 GB / 128 GB	full-size HDMI, display port, camera connector (×2), Altera Max 10 FPGA	90.0 × 85.6	Windows, Linux, Android	Python, C, C++, JavaScript (among others)	53
Variscite DART-MX8M-MINI	r	NXP i.MX 8M MINI (quad Cortex-A53, Cortex-M4)	Cortex-A53: 2.0 GHz	GPIO, PWM	TX/RX, I^2C, SPI, USB 2.0 OTG, USB 2.0 (×2), Ethernet, Wi-Fi, Bluetooth	4 GB	64 GB	LVDS display connector (×2), resistive touch display interface, capacitive touch display interface, camera connector,	55.0 × 30.0 (only compute module)	Yocto, Android, Linux (Debian), FreeRTOS	Python, C, C++, JavaScript (among others)	54

[a]Other brands/examples include: 96Boards, Arrow Dragonboard 410 C, Atomic Pi, Avalue Technology, Banana Pi, Boundary Devices, Compulab SBC-iMX8M-Mini - NXP i.MX8M Mini, Cubietruck, Banana Pi M4, Diamond Systems, Digi ConnectCore 6UL, Embedded Artists iMX6 UltraLite COM, Helios PC/104, DragonBoard, EMAC, Embedded Artists, FriendlyARM Tiny 210, FriendlyARM Micro 2440, Gateworks, HummingBoard Edge, iBASE, iWave, Keith & Koep - Trizeps VIII Mini, Khadas, Kontron, Libre Computer, MiCa 7688, Micro-STX, Myir, Norco, Nvidia, NXP Layerscape FRWY-LS1012A board, Odroid, Onlogic, Pico-ITX, Pine A64 (+), Qihua, Rock64, SolidRun, TechNexion SBC-APL-350, Technologic Systems, Texas Instruments AM65x evaluation module, UDOO, VersaLogic Blackbird, Wandboard.

Table S3. Specifications of selected popular professional control and data acquisition modules applicable in research related to chemistry. (These specifications are provided for reference only. For accurate and up-to-date specifications, please refer to the manufacturers' websites.)

Professional grade electronic controllers and data acquisition systems[a]	**Picture (alphabet in Figure 2)**	**Pins**					**Communication interfaces**	**Other features**	**Dimensions (l × w, mm)**	**Software**	**Compatible computer languages**	**Website**
		Digital I/O	Analog input	ADC resolution (bit)	Analog output	DAC resolution (bit)						
National Instruments DAQ USB 6343	a	48	single ended: 32, differential: 16	16	4	16	USB	Frequency generator channel, general-purpose counter (×4)	261.6 × 172.7	LabView	LabView	55
LabJack T7	NA	23	single ended: 14, differential: 7	16 (high-speed)	2	12	USB, SPI, I^2C, Ethernet	PWM outputs with individual phase control (×5), frequency input (×2), pulse width input (×2), pulse output (×5), high-speed counter (×4), line-to-line input (×2), quadrature Inputs (3 pairs)	188.0 × 74.9	LabJack, DAQFactory	C, C++. C#, Python, MATLAB, Visual Basic .NET, Delphi, Java, LabView, Node.js, Processing	56
LabJack T7 Pro	NA	23	single ended: 14, differential: 7	24 (low-speed)	2	12	USB, SPI, I^2C, Ethernet, Wi-Fi	PWM outputs with individual phase control (×5), frequency input (×2), pulse width input (×2), pulse output (×5), high-speed counter (×4), line-to-line input (×2), quadrature Inputs (3 pairs)	188.0 × 74.9	LabJack, DAQFactory	C, C++. C#, Python, MATLAB, Visual Basic .NET, Delphi, Java, LabView, Node.js, Processing	57
Pico data logger (ADC 24)	b	4	single ended: 16, differential: 8	24	NA	NA	USB	NA	184.0 × 135.0	PicoLog, PicoSDK, PicoScope	NA	58
Digilent Analog Discovery 2	d	18	2 channels (also called Scopes)	14	2 channels (also called Arbitrary Waveform Generator)	14	USB, SPI, I^2C, UART, Parallel, CAN	oscilloscope, waveform generator, power supply, voltmeter, data logger, logic analyzer, pattern generator, static I/O, spectrum analyzer, network analyzer, impedance analyzer, and protocol analyzer	80.0 × 80.0 (only main board)	WaveForms	Python, C++, LabView, MATLAB	59
PLC Arduino ARDBOX 20 I/Os Analog HF Modbus	e	10	6	ND	7	ND	USB, SPI, I^2C, RS-485, RS-232	PWM (×6)	114.0 × 101.0	Arduino IDE	C++	60
panStamp Q4.0	NA	binary input: 8, binary output: 2	2	ND	NA	NA	USB, RS-485, LoRa/LoRaWAN, Narrowband IoT, LTE-M, GPRS	in-built thermistor	115.0 × 90.0	Arduino IDE	C++	61
Cypress PSoC 6 WiFi-BT Pioneer Kit	c	14[b]	6[b]	12	NA	NA	USB, Wi-Fi, Bluetooth, TX/RX[b], I^2C[b], SPI[b]	display shield, capacitance touch sensor (slider (5 elements) and button (×2)), compatible with Arduino shields, PWM (×6)[b]	135.0 × 70.0	PSoC Creator	C,C++	62
Omega OMB-DAQ-2416-4AO	NA	8	single ended: 32, differential: 16	24	4	16	USB	differential analog inputs can be configured for thermocouples, counter (×2), oscilloscope, function Generator	245.0 × 146.0	TracerDAQ, LabView	Visual C/C++, Visual Basic, C# .Net, Visual Basic .Net	63
MonoDAQ-U-X	NA	8	single ended: 8, differential: 4	16	1	12	USB, I^2C, UART	thermocouple input (×4), in-built sensors (humidity, temperature, 3-axial acceletometer and 3-axial gyroscope)	95.5 × 83.6	DEWESoft X3, Isotel DAQ & Metering	Python	64
Diamond-MM-32DX-AT Analog I/O Module	NA	24	single ended: 32, differential: 16	16	4	16	PC104	waveform generator, counter/timer for programmable interrupt functions	95.9 × 90.2	Diamond SDK, Universal Driver	C	65

[a]Other brands/examples include: Denkovi Assembly Electronics, MCC, openDAQ, Pico Technology - DrDAQ, Zeta-tec, LabSmith, Measurement Computing, Texas Instruments SimpleLink multi band CC1352R wireless MCU Launchpad SensorTag kit.

[b]available on Arduino headers of PSoC 6 Pioneer board

Table S4. Representative examples of reports related implementation of FPGA in chemical sciences (literature survey focused on years 2010-2020). (The nomenclature used in the cited references has been followed as much as possible.)

Electronic controller(s)	Function	References
an FPGA	chemical sensor system for mimicking biological olfaction: control of scanning process	66
an FPGA	signal analysis and classification for surface plasmon assisted microscopy: signal (image) processing	67
an FPGA	time resolved analysis in high resolution mass spectrometry: square-wave pulse generator, data acquisition	68
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