

# Double-A XBee Sensor Node v1

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Bill of Materials

Qty	Part #	Mouser #	Mfr. #	Manufacturer	Desc.
1	A1	888-XB24-Z7WIT-004	XB24-Z7WIT-004	Digi International	Zigbee / 802.15.4 Modules XBee ZB w/WiredWhip AT Router F/W
2	A1	855-M22-7131042	M22-7131042	Harwin	Headers & Wire Housings 10 PIN SIL VERTICAL GOLD+TIN SOCKET
1	B1	534-2462	2462	Keystone Electronics	Cylindrical Battery Contacts, Clips, Holders & Springs 2 CELL AA PC HOLDER
1	B2	658-CR2016	CR2016	Panasonic	Coin Cell Battery 3V 20 X 1.6 MM 75mA
1	B2	712-BAT-HLD-002-SMT	BAT-HLD-002-SMT	Linx Technologies	Coin Cell Battery Holders Bat Holder CR2016 Surface Mount
8	C1,2,3,6,7,12,13,15	581-08055C104K	08055C104KAT2A	AVX	Multilayer Ceramic Capacitors MLCC - SMD/SMT 0805 0.1uF 50volts X7R 10%
2	C4,5	77-VJ0805A270GXXPBC	VJ0805A270GXXPW1BC	Vishay	Multilayer Ceramic Capacitors MLCC - SMD/SMT 0805 27pF 25volts C0G 2%
5	C8,9,10,11,14	81-GRM21BR71A106KA3L	GRM21BR71A106KA73L	Murata	Multilayer Ceramic Capacitors MLCC - SMD/SMT 0805 10uF 10volts X7R + - 10%
2	D1,2	512-1N4148WS	1N4148WS	Fairchild Semiconductor	Diodes - General Purpose, Power, Switching Small Signal Diode
1	D3	604-APT2012EC	APT2012EC	Kingbright	Standard LEDs - SMD HI EFF RED WTR CLR
1	D4	604-APT2012SGC	APT2012SGC	Kingbright	Standard LEDs - SMD GREEN WATER CLEAR
1	D8	604-APT2012YC	APT2012YC	Kingbright	Standard LEDs - SMD YELLOW WATER CLEAR
1	L1	963-LBR2012T100K	LBR2012T100K	Taiyo Yuden	Fixed Inductors INDCTR LW RDC WND 0805 10uH 10%
2	L2,3	963-NRS4018T4R7MDGJ	NRS4018T4R7MDGJ	Taiyo Yuden	Fixed Inductors INDCTR LW PROFL WND 4.7uH 20%
1	Q1	942-IRLML6344TRPBF	IRLML6344TRPBF	International Rectifier	MOSFET MOSFT 5.0A 29mOhm 30V 2.5V drv capable
3	R1,3,8	660-RK73H2ATTD1002F	RK73H2ATTD1002F	KOA Speer	Thick Film Resistors - SMD 1/8watts 10Kohms 1%
1	R10	660-RK73H2ATTD3093F	RK73H2ATTD3093F	KOA Speer	Thick Film Resistors - SMD 1/8watts 309Kohms 1%
1	R11	660-RK73H2ATTD2493F	RK73H2ATTD2493F	KOA Speer	Thick Film Resistors - SMD 1/8watts 249Kohms 1%
1	R13	660-RK73H2ATTD5623F	RK73H2ATTD5623F	KOA Speer	Thick Film Resistors - SMD 1/8watts 562Kohms 1%
1	R14	660-RK73H2ATTD4701F	RK73H2ATTD4701F	KOA Speer	Thick Film Resistors - SMD 1/8watts 4.7Kohms 1%
1	R2	660-RK73H2ATTD4752F	RK73H2ATTD4752F	KOA Speer	Thick Film Resistors - SMD 1/8watt 47.5Kohms 1%
2	R4,5	660-RK73H2ATTD2201F	RK73H2ATTD2201F	KOA Speer	Thick Film Resistors - SMD 1/8watts 2.2Kohms 1%
3	R6,15,16	660-RK73H2ATTD1001F	RK73H2ATTD1001F	KOA Speer	Thick Film Resistors - SMD 1/8watts 1Kohms 1%
1	R7	660-RK73H2ATTD2200F	RK73H2ATTD2200F	KOA Speer	Thick Film Resistors - SMD 1/8watts 220ohms 1%
2	R9,12	660-RK73H2ATTD9763F	RK73H2ATTD9763F	KOA Speer	Thick Film Resistors - SMD 1/8watts 976Kohms 1%
2	SW1,7	611-PTS635SL43SMTRLF	PTS635SL43SMTR LFS	C&K Components	Tactile Switches Switch Tact 6X3.5Mm Mom Spst Smd
1	TB1	651-1984617	1984617	Phoenix Contact	Fixed Terminal Blocks PT 1.5/2-3.5H 2POS HRZ 3.5mm SCREW
1	U1	556-ATMEGA328P-AU	ATMEGA328P-AU	Atmel	8-bit Microcontrollers - MCU 32KB In-system Flash 20MHz 1.8V-5.5V
1	U2	700-DS3231SN#T&R-	DS3231SN#T&R	Maxim Integrated	Real Time Clock Integrated RTC/TCXO/Crystal
1	U3	579-MCP9808T-E/MS	MCP9808T-E/MS	Microchip	Board Mount Temperature Sensors Silicon temp sensor with I2C interface
2	U4,5	579-MCP1640DT-I/CHY	MCP1640DT-I/CHY	Microchip	Voltage Regulators - Switching Regulators 500 kHz 300 mA Syn Boost Converter
1	Y1	815-ABM2-8-D4Y-T	ABM2-8.000MHZ-D4Y-T	ABRACON	Crystals 8.0MHz 18pF 30ppm -40C +85C

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Solder jumpers determine the configuration as noted.

Config no.	REG1	REG2	Notes	SJ1	SJ2	SJ3	SJ4
1	3.3V	Absent	Regulator 1 powers the MCU, XBee and sensors. Use when sensors can run on 3.3V and one regulator supplies sufficient current. Simplest and most energy efficient configuration.	Open	Open	REG1	Soldered
2	5V	3.3V	Regulator 1 powers the MCU and sensors with 5V; Regulator 2 powers the XBee with 3.3V. Use only when a sensor requires a 5V supply. Not as energy efficient as Config #1.	Soldered	Soldered	REG2	Open
3	3.3V	3.3V	Regulator 1 powers the MCU and sensors with 3.3V; Regulator 2 powers the XBee with 3.3V. Use only when one regulator does not supply sufficient current. Not as energy efficient as Config #1 but more efficient than Config #2.	Open	Soldered	REG2	Soldered

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Optional components, X = required.

Part	Value	Config 1	Config 2	Config 3	Notes
A1	XB24-Z7WIT-004	X	X	X	
B1	2xAA	optional	optional	optional	Either B1 or TB1 must supply the main 3VDC power for the circuit (they are wired in parallel).
B2	CR2016	X	X	X	
C1	100nF	X	X	X	
C2	100nF	X	X	X	
C3	100nF	X	X	X	
C4	27pF	X	X	X	
C5	27pF	X	X	X	
C6	100nF	optional	optional	optional	Required for serial bootloader programming. See Note 1.
C7	100nF	optional	optional	optional	Required to measure battery voltage via ADC6 and ADC7.
C8	10uF	X	X	X	
C9	10uF	X	X	X	
C10	10uF	optional	X	X	See Note 2.
C11	10uF	optional	X	X	See Note 2.
C12	100nF	X	X	X	
C13	100nF	optional	optional	optional	Required if MCP9808 temperature sensor is installed.
C14	10uF	X	X	X	
C15	100nF	X	X	X	
D1	1N4148	optional	optional	optional	Required for serial bootloader programming. See Note 1.
D2	1N4148	optional	X	optional	See Note 2.
D3	Red	optional	optional	optional	May be used for diagnostic purposes.
D4	Green	optional	optional	optional	May be used for diagnostic purposes.
D8	Yellow	optional	optional	optional	May be used for diagnostic purposes.
JP1	ICSP	X	X	X	
JP2	FTDI	optional	optional	optional	See Note 1.
JP3	Run/Pgm	optional	optional	optional	The middle pad can be hardwired to the run pad if only ICSP programming will be used.
JP4	GNDSEL	optional	optional	optional	Can be hardwired if desired. See Note 3.
L1	10uH	X	X	X	
L2	4.7uH	X	X	X	
L3	4.7uH	optional	X	X	See Note 2.
Q1	IRLML6344TRPBF	optional	optional	optional	Required for switched ground. See Note 3.
R1	10K	X	X	X	
R2	47.5K	optional	optional	optional	Required to measure battery voltage via ADC6 and ADC7.
R3	10K	optional	optional	optional	Required to measure battery voltage via ADC6 and ADC7.
R4	2.2K	X	X	X	
R5	2.2K	X	X	X	
R6	1K	optional	optional	optional	Required if D8 is installed.
R7	220	optional	optional	optional	Required for switched ground. See Note 3.
R8	10K	optional	optional	optional	Required for switched ground. See Note 3.

R9	976K	X	X	X	
R10	309K	X	X	X	
R11	249K	X	X	X	
R12	976K	optional	X	X	See Note 2.
R13	562K	optional	X	X	See Note 2.
R14	4.7K	optional	X	optional	See Note 2.
R15	1K	optional	optional	optional	Required if D3 is installed.
R16	1K	optional	optional	optional	Required if D4 is installed.
SW1	RESET	X	X	X	
SW7	SW7	optional	optional	optional	For user application.
TB1	+BAT-	optional	optional	optional	Either B1 or TB1 must supply the main 3VDC power for the circuit (they are wired in parallel).
U1	ATmega328P-AU	X	X	X	
U2	DS3231	X	X	X	
U3	MCP9808	optional	optional	optional	Accurate ( $\pm 0.25^{\circ}\text{C}$ typical) temperature sensor.
U4	MCP1640D	X	X	X	Boost regulator #1.
U5	MCP1640D	optional	X	X	Boost regulator #2.
Y1	8MHz	X	X	X	

- Note 1.

The FTDI header is supplied primarily to allow debugging via the serial port. Because the AA XBee Node changes the system clock frequency during normal operation, programming via ICSP is the intended method. However, it may be possible to configure a serial bootloader which operates with a 1MHz system clock speed and a proportionally lower baud rate.
- Note 2.

These components marked as optional may be installed to allow ease of changing between configurations by just setting the solder jumpers accordingly.
- Note 3.

Sensors and other circuitry installed in the prototyping area should normally use a switched ground, i.e. the ground is connected via a low-side MOSFET switch (Q1). This usually results in minimum current consumption during sleep intervals. However, the prototyping area ground can optionally be connected to the hard circuit ground via the three-pin header near Q1.