BCM4343W IoT Starter Kit
Hardware User Guide

Version 2.0

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1 Introduction

The Avnet BCM4343W IoT Starter Kit enables easy prototyping of cloud-connected IoT designs and rapid transition from development to production with a pre-certified wireless SoC module.

The Starter Kit features an Arduino™ form-factor carrier and pre-certified Avnet BCM4343W SoC module that combines an advanced Broadcom® 2.4GHz 802.11 b/g/n WiFi and Bluetooth® 4.1 combo SoC, together with 8Mb SPI Serial Flash and STM32F411 ARM® Cortex™ M4 Microcontroller (with 512KB Flash, 128KB RAM)

The Avnet IOT Starter Kit Carrier facilitates access from the MCU's peripherals to Arduino-compatible headers as well as a Pmod™-compatible 2x6 peripheral connector, allowing connection to a range of expansion boards.

Application development is supported by Broadcom's WICED™ Software Development Kit (SDK), which includes Amazon Web Services (AWS) examples to accelerate cloud-connected product development.

1.1 BCM4343W IoT Starter Kit Features

- Arduino™ form-factor baseboard
- Pre-certified Avnet BCM4343W SoC Module
  - WiFi + BLE + MCU module
  - STM32F411 ARM® Cortex™ M4 MCU
  - 512KB Flash, 128KB SRAM, 8Mb SPI Serial Flash
  - Supports 802.11 b/g/n and Bluetooth 4.1 (with an upgrade path to Bluetooth 4.2)
  - Dual fractal PCB antennas supporting antenna diversity
- Arduino compatible shield expansion connectors
  - GPIO (4)
  - Analog inputs (3)
  - Two I2C ports (1 shared)
  - SPI port
  - Two UARTs (1 shared)
- Peripheral expansion connector (Pmod-compatible, 2x6 format)
  - I2C port (shared)
- USB-based JTAG debugger/ programmer and serial UART port
- 1x Reset push button switch
- 1x User push button switch
- 2x User LEDs
- 4x Status LEDs (UART, JTAG and WLAN activity LEDs, plus 3V3 Power LED)
- 1x Ambient light sensor
- USB Powered (5V), onboard high capacity 5V to 3.3V regulated supply

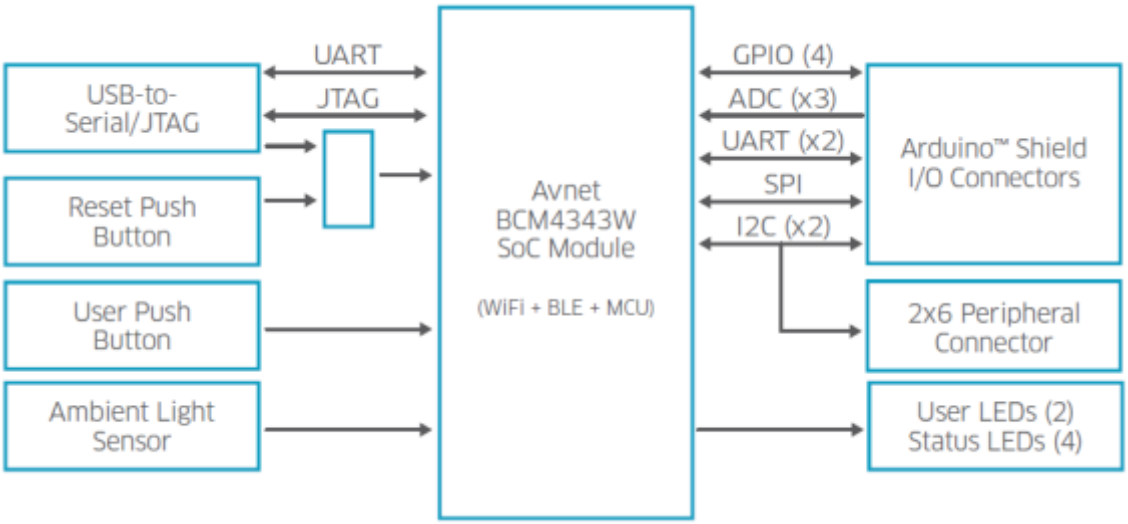


Figure 1 – BCM4343W IOT STARTER KIT High-Level Block Diagram

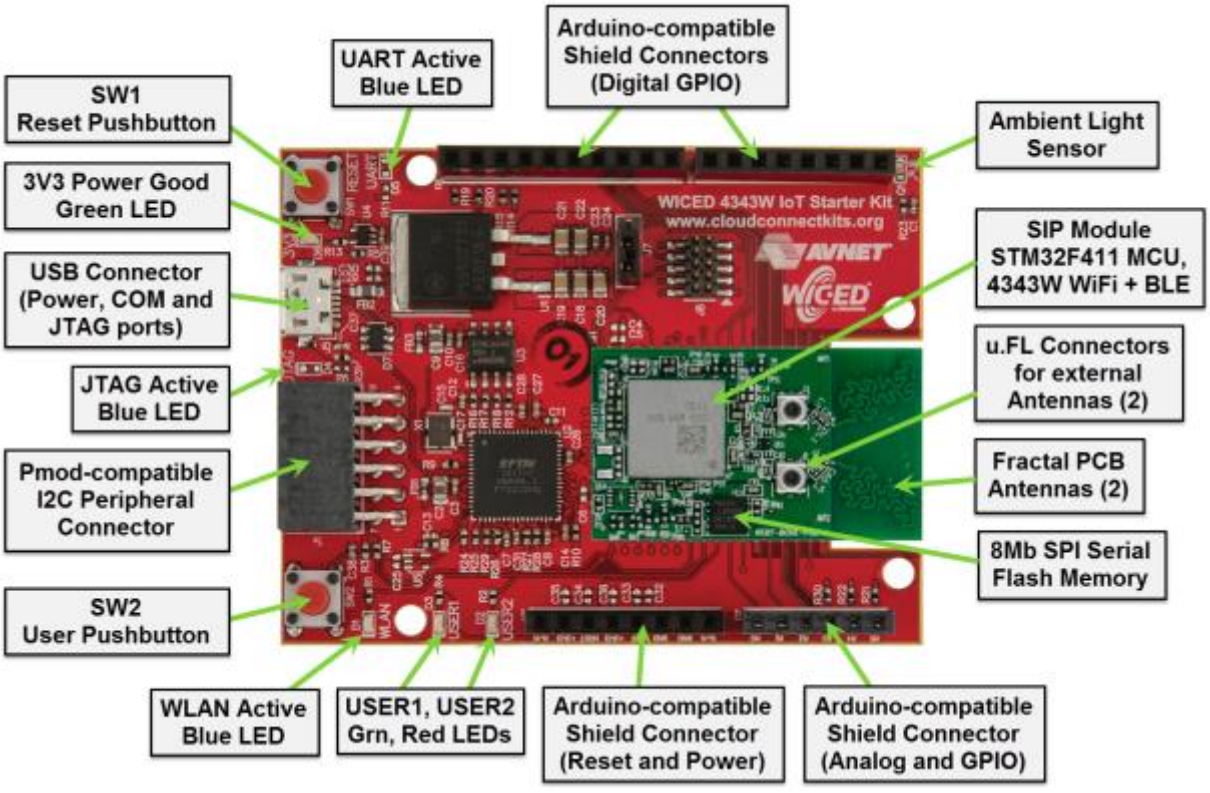


Figure 2 – BCM4343W IOT STARTER KIT – Feature Identification

1.2 Block Diagram

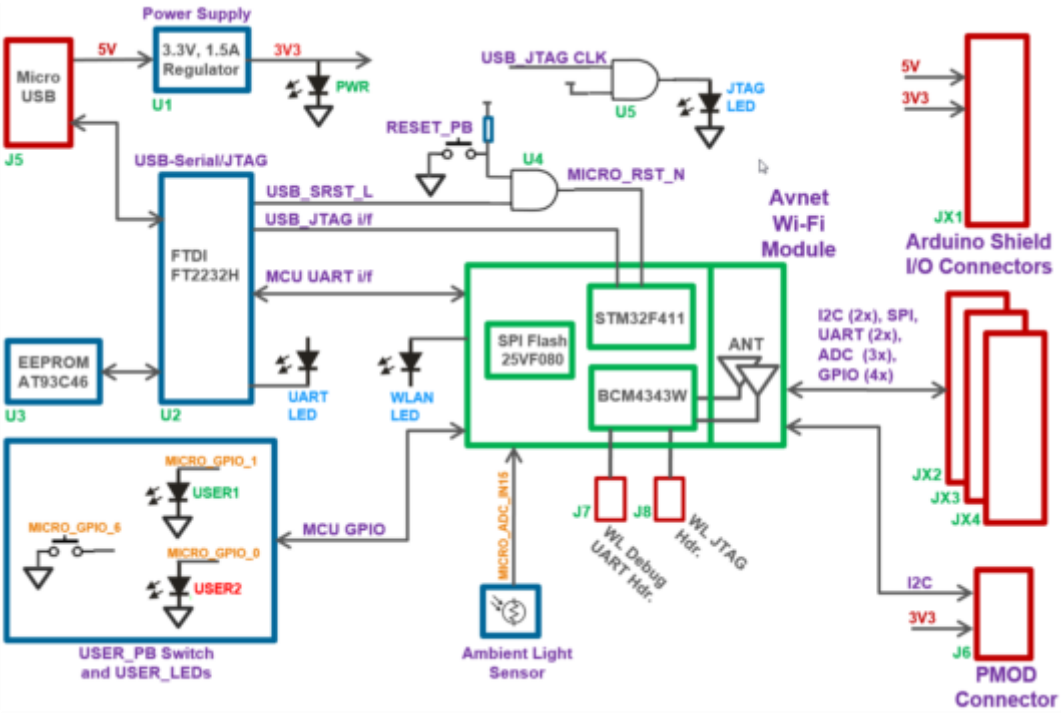


Figure 3 – BCM4343W IoT Starter Kit - Detailed Block Diagram

1.3 Locating Key Components

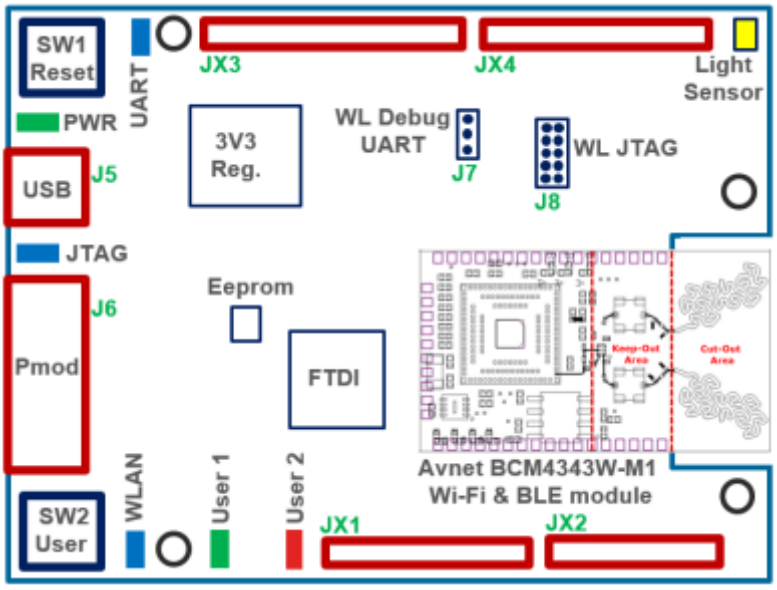


Figure 4 – BCM4343W IoT Starter Kit – Key Component Placement

2 Functional Description

The following sections provide a description of each board feature.

2.1 MicroUSB Connector (J5) - Serial Console and JTAG Interfaces

The UART and JTAG interfaces are implemented over a single USB interface using FTDI device FT2232HQ. Dual interface FTDI device is configured to implement JTAG (channel A) and UART communication (channel B). A companion EEPROM (AT93C46) is used for non-volatile storage of interface configuration.

2.2 Status/Activity LEDs

3V3 (D6) – GREEN, connected to 3.3V regulator output, indicates power good.

UART (D5) – BLUE, indicates USB Serial Console UART activity (illuminated by a LOW from LED_USB_UART)

JTAG (D4) – BLUE, indicates USB JTAG programming activity (illuminated by FET buffered USB JTAG CLK)

WLAN (D1) – BLUE, indicates WLAN Tx/Rx traffic (illuminated by a HIGH from WiFi_GPIO_1 from BCM4343W)

2.3 Programmable User LEDs

USER1 (D3) – GREEN, illuminates on a LOW from MICRO_GPIO_5 (output from STM32F411 MCU)

USER2 (D2 – RED, illuminates on a LOW from MICRO_GPIO_28 (output from STM32F411 MCU)

Carrier Board		WICED Software		Wireless Module	
LED Name	Description	MCU Port Pin	wiced_gpio_t enumeration	Module Pin#	Module Pin Name
USER1	(D3) Green	B0	WICED_GPIO_29	42	MICRO_GPIO_5
USER2	(D2) Red	B8	WICED_GPIO_18	35	MICRO_GPIO_28

2.4 Pushbutton Switches

RESET (SW1) – Momentary switch, resets the board, Wireless module and any Arduino Shield attached

USER (SW2 – Programmable User switch, active LOW on MICRO_GPIO_6 (input to STM32F411 MCU)

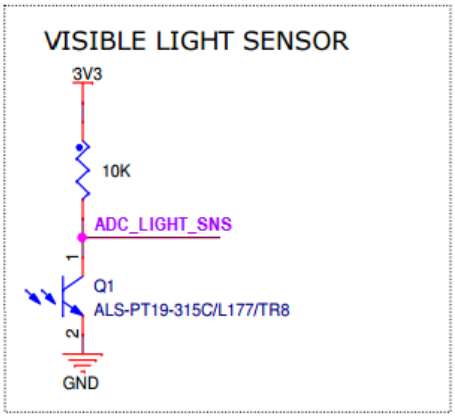
Carrier Board		WICED Software		Wireless Module	
Switch Name	Description	MCU Port Pin	wiced_gpio_t enumeration	Module Pin#	Module Pin Name
SW1	RESET_SW	-	n/a	-	-
SW2	USER_SW	B9	WICED_GPIO_19	34	MICRO_GPIO_A

2.5 Ambient Light Sensor

Phototransistor (Q1) – Low-cost SMD ambient light sensor
from EverLight, part# ALS-PT19-315C/L177/TR8
http://www.everlight.com/file/ProductFile/ALS-PT19-315C-L177-TR8.pdf

The Light Sensor connects directly to STM32F411 MCU's ADC input on MICRO_ADC_IN15

Carrier Board		WICED Software		Wireless Module	
Name	Description	MCU Port Pin	wiced_gpio_t enumeration	Module Pin#	Module Pin Name
Q1	ADC_LIGHT_SNS	C5	WICED_GPIO_30	43	MICRO_ADC_IN15



Notes on light sensor measurements:
Output voltage from this sensor is inversely proportional to light intensity at the sensor.
It is recommended that the application software perform the following adjustment:
Light_Value = (4095 – Light_Measured)

2.6 Avnet BCM4343W IoT Module

The Avnet BCM4343W SoC module is a high performance, highly integrated WiFi and BLE module that includes an ARM® Cortex™ M4 microcontroller for running user application code. Ideal for low-power IoT enabled sensor and actuator based devices that need wireless connectivity to cloud services, it's compact 20 x 35 mm LGA package makes the module a perfect fit for small, embedded applications.

The BCM4343W SoC module is pre-certified, thus minimizing development time and certification costs. The module combines an advanced Broadcom® 2.4GHz 802.11 b/g/n and Bluetooth® 4.1 SoC with 8Mb of serial Flash and a ST Microelectronics STM32F411 ARM® Cortex™ M4 MCU supporting 512KB Flash and 128KB SRAM. Several of the M4 MCU peripheral functions are available on the module I/O, allowing for easy connection to user specified interfaces. Additional security capabilities are available with an optional authentication chip.

The BCM4343W SoC module includes on-board dual fractal PCB antennas for improved RF performance through antenna diversity, as well as dual coax connectors supporting external antenna connection.

Broadcom's WICED™ Software Development Kit (SDK) is used for user application development. Latest versions of WICED SDK include Amazon Web Services (AWS) examples supporting this Avnet BCM4343W IoT Starter Kit, providing practical examples of how to utilize AWS cloud services.

Avnet BCM4343W IoT Module is orderable as a standalone, FCC certified SoC solution.
Ordering part#: AES-BCM4343W-M1-G

Refer to the GitHub website and the Getting Started Guide for application software examples for this module.

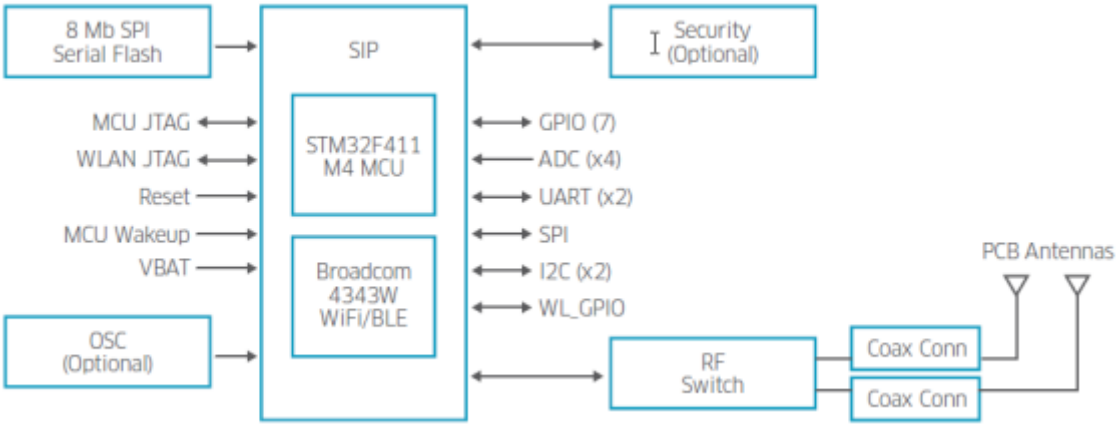


Figure 5 – Avnet BCM4343W IoT Module High-Level Block Diagram

Figure 6 – Front and Rear Views of Avnet BCM4343W IoT Module

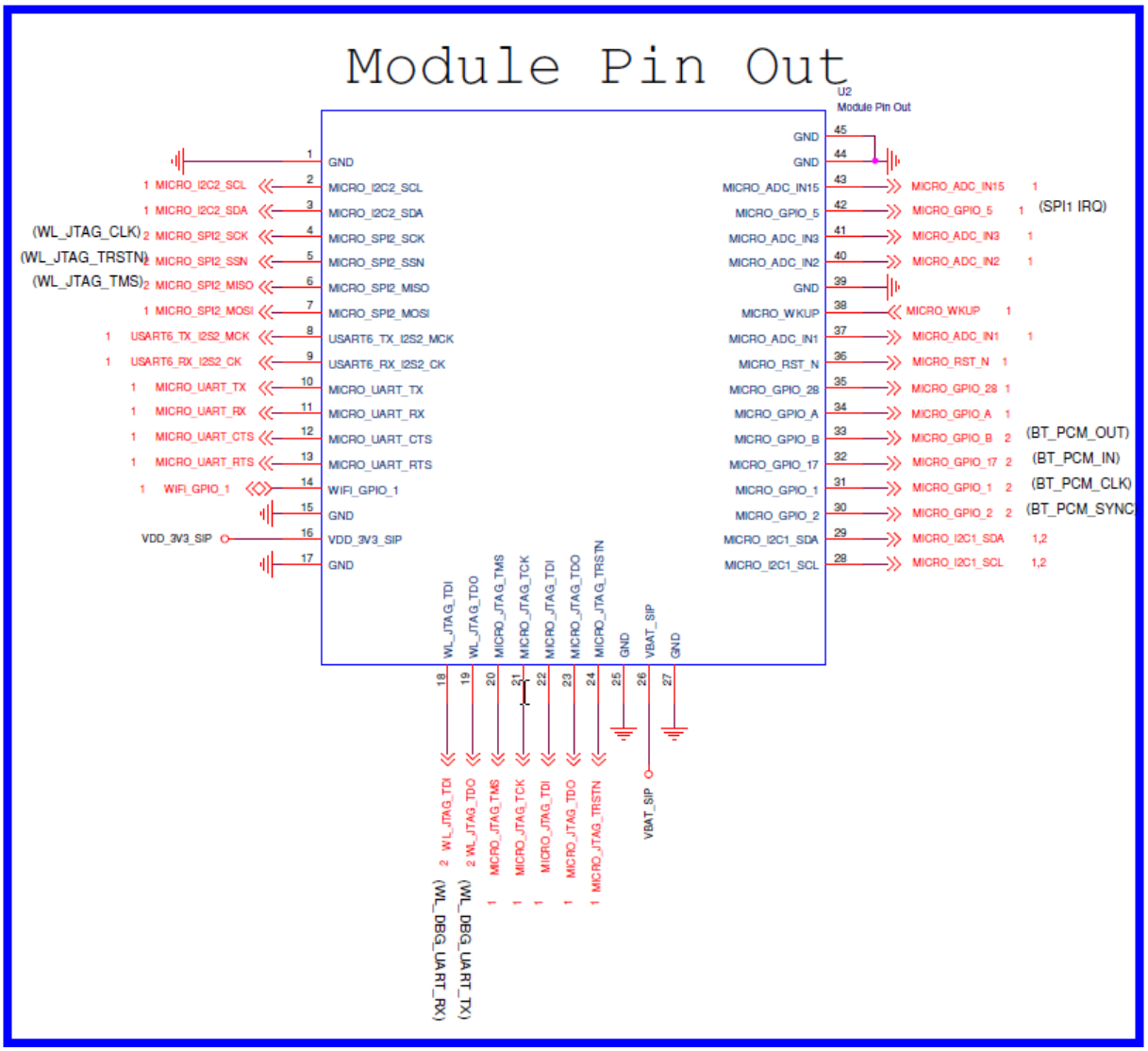


Figure 7 – Pinout of Avnet BCM4343W IoT Module

2.7 Wi-Fi Debug UART Header (J7)

An unpopulated through-hole three-pin header site is provided for access to the Wi-Fi Debug UART. In the event a user needs to utilize this interface for WLAN debugging purposes, a right-angle 3 pin header needs to be added to the board (and suitable USB to UART serial cable and terminal software used).

Pin#	Description
1	WL_DBG_UART_TX
2	WL_DBG_UART_RX
3	GND

2.8 Wi-Fi JTAG Header (J8)

An unpopulated SMT 2×5 pin header is provided. (This connector site is not intended for User access)

2.9 Arduino Shield Connectors

- Compatible with Arduino UNO R3 footprint.
- Supports 3.3V I/O shields.
  NOTE: 5V I/O not supported!
- A useful table of common shields and the interface pins they require is located at:
  http://playground.arduino.cc/Main/ShieldPinUsage

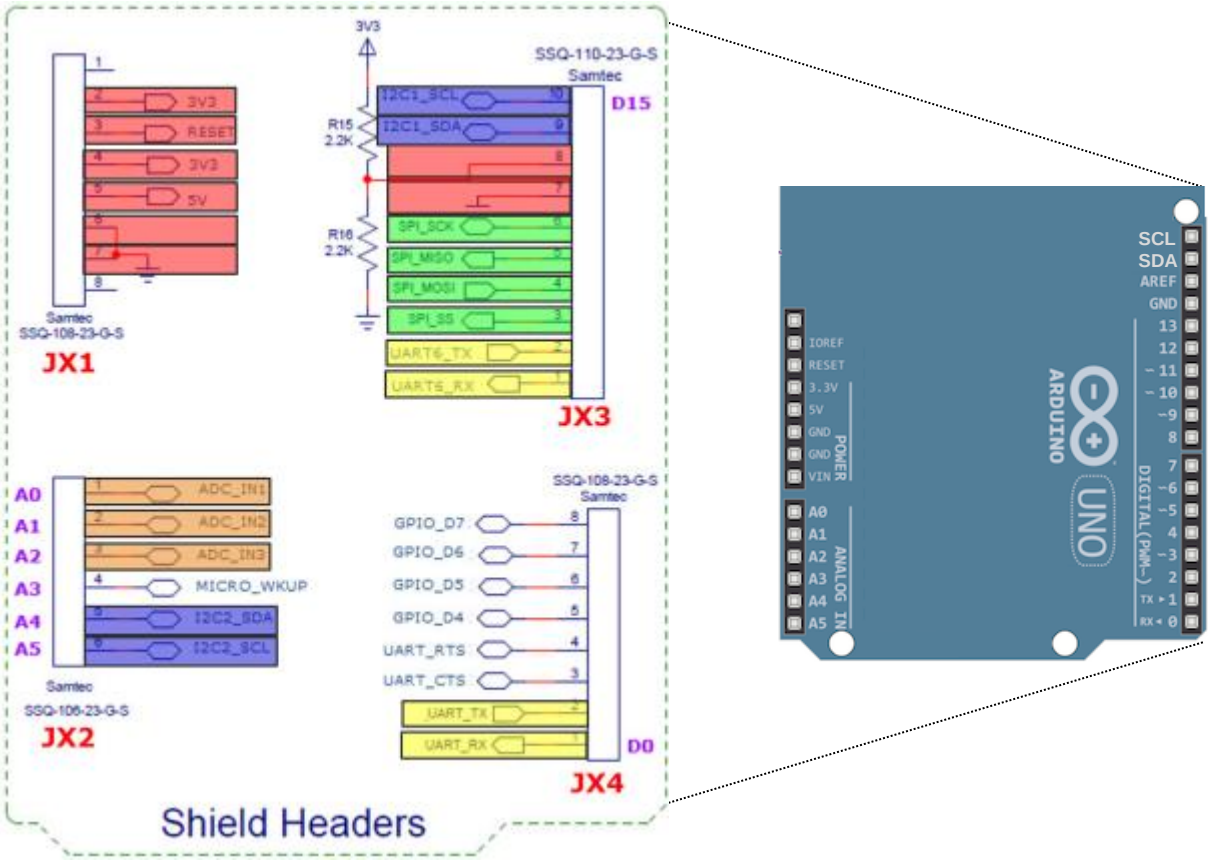


Figure 8 – BCM4343W IoT Starter Kit Arduino Shield Pinout (vs Arduino UNO R3)

NOTE: The top-to-bottom pin sequencing of **JX1** and **JX2** differs from that of **JX3** and **JX4**. The sequencing used is compatible with the standard Arduino pinouts provided at mbed.org. When viewing these connectors from the side of the board, pin 1 will always be on the left

Arduino Shield Connectors		WICED Software Detail		Wireless Module Pinout	
Name	PCB Connector Pin#	MCU Port Pin	wiced_gpio_t enumeration	Module Pin#	Module Pin Name
D15	JX3.10	B6	WICED_GPIO_11	28	MICRO_I2C1_SCL
D14	JX3.9	B7	WICED_GPIO_12	29	MICRO_I2C1_SDA
AREF	JX3.8				
GND	JX3.7				
D13	JX3.6, J8.4	B13	WICED_GPIO_23	4	MICRO_SPI2_SCK
D12	JX3.5, J8.2	B14	WICED_GPIO_24	6	MICRO_SPI2_MISO
D11	JX3.4	B15	WICED_GPIO_25	7	MICRO_SPI2_MOSI
D10	JX3.3, J8.10	B12	WICED_GPIO_22	5	MICRO_SPI2_SSN
D9	JX3.2	C6	WICED_GPIO_13	8	USART6_TX_I2S2_MCK
D8	JX3.1	C7	WICED_GPIO_14	9	USART6_RX_I2S2_CK
Name	PCB Connector Pin#	MCU Port Pin	wiced_gpio_t enumeration	Pin#	Module Pin Name
D7	JX4.8	C3	WICED_GPIO_17	33	MICRO_GPIO_B
D6	JX4.7	C2	WICED_GPIO_28	32	MICRO_GPIO_17
D5	JX4.6	C1	WICED_GPIO_27	30	MICRO_GPIO_2
D4	JX4.5	C0	WICED_GPIO_26	31	MICRO_GPIO_1
D3	JX4.4	A12	WICED_GPIO_16	13	MICRO_UART_RTS
D2	JX4.3	A11	WICED_GPIO_15	12	MICRO_UART_CTS
D1	JX4.2	A9	WICED_GPIO_9	10	MICRO_UART_TX
D0	JX4.1	A10	WICED_GPIO_10	11	MICRO_UART_RX

Table 1 – JX3, JX4 Shield Connectors

Arduino Shield Connectors		WICED Software Detail		Wireless Module Pinout	
Name	PCB Connector Pin#	MCU Port Pin	wiced_gpio_t enumeration	Pin#	Module Pin Name
A0	JX2.1	A1	WICED_GPIO_2	37	MICRO_ADC_IN1
A1	JX2.2	A2	WICED_GPIO_3	40	MICRO_ADC_IN2
A2	JX2.3	A3	WICED_GPIO_4	41	MICRO_ADC_IN3
A3	JX2.4	A0	WICED_GPIO_1	38	MICRO_WKUP
A4	JX2.5, J6.4, J6.10	B11	WICED_GPIO_21	3	MICRO_I2C2_SDA
A5	JX2.6, J6.3, J6.9	B10	WICED_GPIO_20	2	MICRO_I2C2_SCL

Table 2 – JX2 Shield Connector

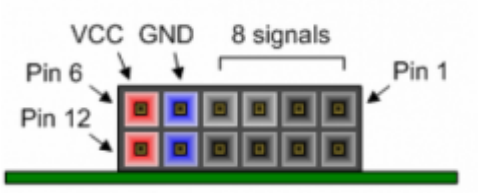
Arduino Shield Connectors		Wireless Module Pinout	
Name	PCB Connector Pin#	Pin#	Module Pin Name
n/c	JX1-1	n/c	n/c
IOREF	JX1-2	16, 26	VDD_3V3_SIP, VBAT_SIP
NRST	JX1-3	36	MICRO_RST_N
3V3	JX1-4	16, 26	VDD_3V3_SIP, VBAT_SIP
5V	JX1-5	-	5V
GND	JX1-6	1, 15, 17, 25, 27, 39, 44, 45	GND
GND	JX1-7		GND
VIN	JX1-8	n/c	

Table 3 – JX1 Shield Connector (Power and Reset)

2.10 PMOD™-compatible Connector

An I2C interface is provided on this connector. The signals on upper and lower rows of the connector are identical (ie. the connector of a 1x6 Pmod™-compatible peripheral board may be plugged into either top or bottom row)

Notes:
The I2C signals have 4.7 kΩ pull-up resistors.
The I2C2 signals are also routed to pins on the JX2 Arduino Shield connector.
The sequencing of the Pmod connector pins is nonstandard.



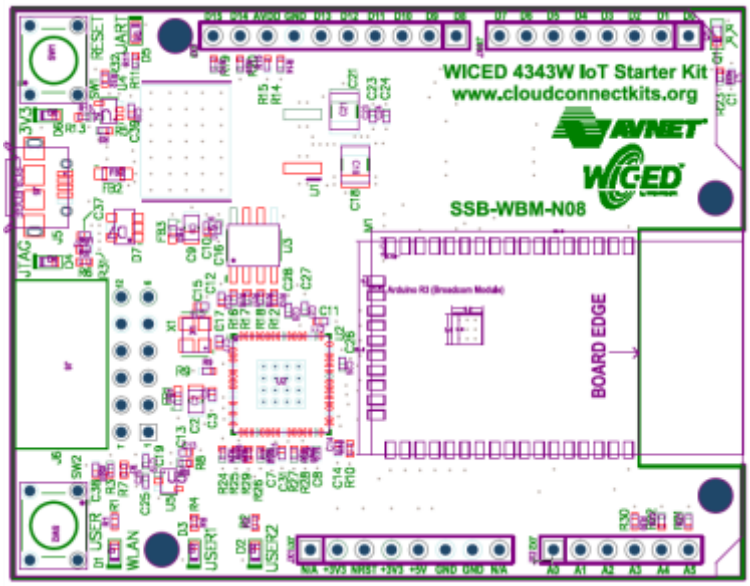
#	I2C	#	I2C
1		7	
2		8	
3	SCL	9	SCL
4	SDA	10	SDA
5	GND	11	GND
6	VCC	12	VCC

Figure 9 – J6 Pmod Connector Detail

2.11 System Power

- Input voltage is +5V via the micro-USB connector at edge of the Carrier Board.
- 5V to 3.3V regulation is implemented using a 1.5A rated Linear Regulator from ON Semiconductor Part# NCP565D2T33R4G (On Semi NCP565 device in a DPAK3 package) http://www.onsemi.com/pub_link/Collateral/NCP565-D.PDF

3 Mechanicals



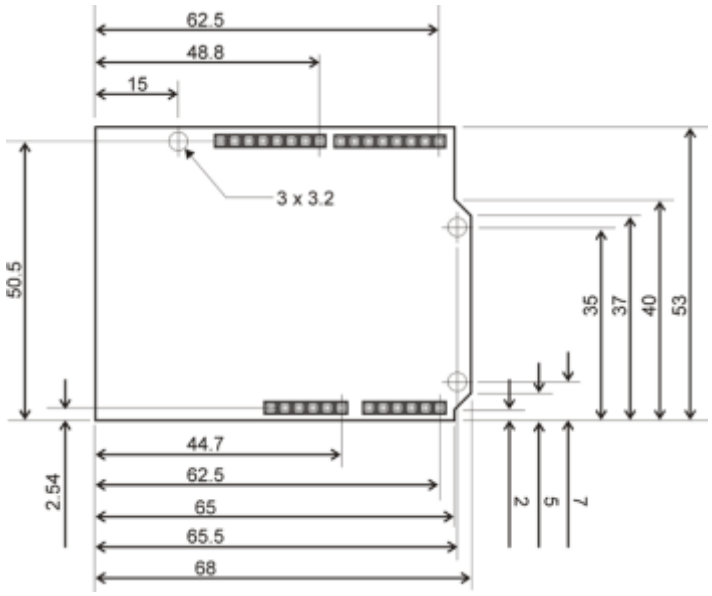


Figure 10 – Arduino Mechanical Dimensions that this board is based on

3.1 Mounting Holes

- 4 mounting holes are provided
- Wireless module dimensions are 35 mm x 20 mm

4 Appendix A – STMicro MEMS Inertial & Environmental Sensor Eval Board

STMicro's **X-NUCLEO-IKS01A1** MEMS Inertial & Environmental Sensor Eval Board (an expansion board for STM32 Nucleo systems) is a useful low-cost Arduino-compatible Shield that can be stacked onto a BCM4343W IoT Starter Kit to provide access to multiple devices from STMicro's Sensor portfolio:

- **LSM6DS0:** MEMS 3D accelerometer (±2/±4/±8 g) plus 3D gyroscope (±245/±500/±2000 dps)
- **LIS3MDL:** MEMS 3D magnetometer (±4/ ±8/ ±12/ 16 gauss)
- **LPS25HB:** MEMS pressure sensor, 260-1260 hPa absolute digital output barometer
- **HTS221:** Capacitive digital relative humidity and temperature

In context of the "Hack Day" reference design, detail of the interface to the **LSM6DS0** combo Accelerometer and Gyro sensor device are detailed below…

Table 4. Arduino UNO R3 connector table

Connector	Pin(1)	Signal
CN5	7	GND
	9	I²C SDA
	10	I²C SCL
CN6	2	3.3V
	4	3.3V
	6	GND
	7	GND
CN8	3	INT1 (DIL24)
	4	INT2 (DIL24)
	5	LIS3MDL INT1
	6	LIS3MDL DRDY
CN9	3	USER INT (optional)
	5	LSM6DS0 INT1
	6	LPS25HB* INT1
	7	HTS221 DRDY

1. Any unlisted pins are not connected.

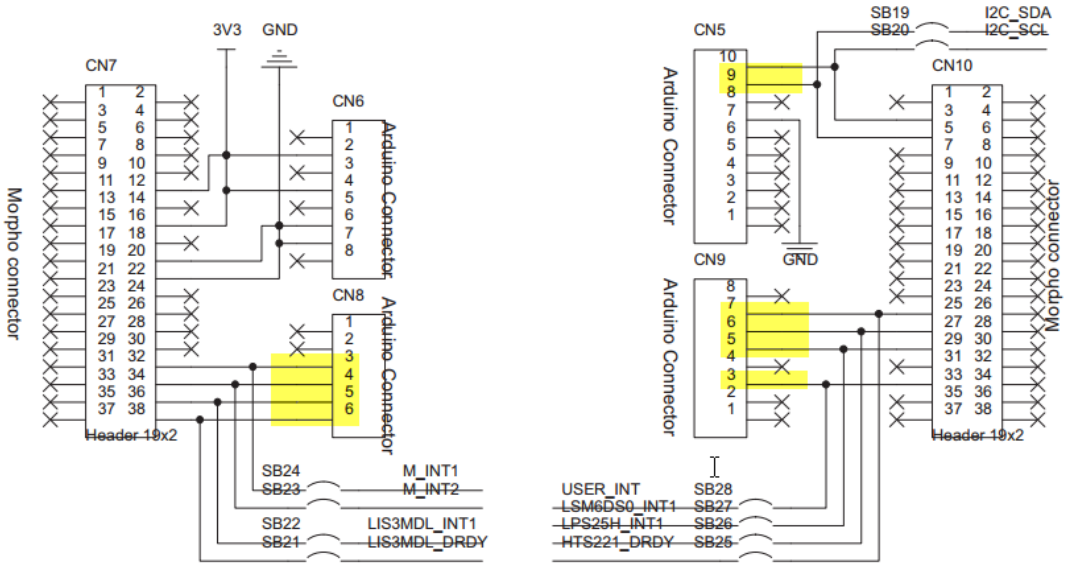


Figure 11 – X-NUCLEO-IKS01A1 Shield Pinout

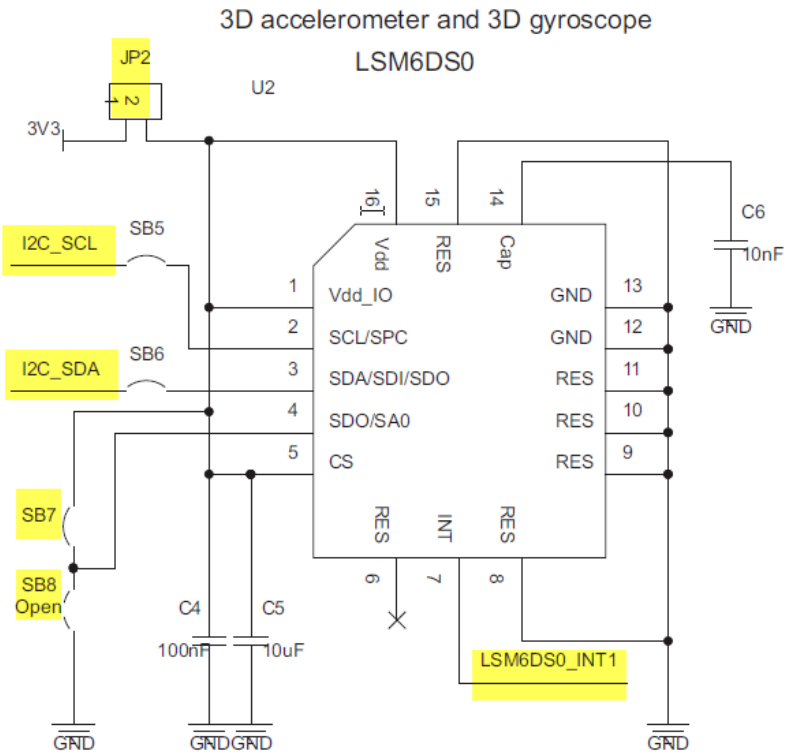


Figure 12 – Accelerometer & Gyro I2C Interface, Solder-Bridges and Power Jumper

Setup of this board to source accelerometer and gyro measurements requires the following
JP2 = closed, **SB7** = closed, **SB8** = open

Additional documentation on the STMicro **X-NUCLEO-IKS01A1** MEMS Inertial & Environmental Sensor Eval Board may be sourced from the following page:
www.st.com/web/catalog/tools/FM116/SC1248/PF261191