

IEEE 802.11 b/g/n SmartConnect Wi-Fi Module

PRELIMINARY DATASHEET

Description

The Atmel® | SMART SAMW25 module is based on the industry-leading low-power 2.4GHz IEEE® 802.11 b/g/n Wi-Fi® ATWINC1500 SoC (System on Chip) combined with the ARM® Cortex®-M0+ based microcontroller technology from Atmel.

This turnkey system provides an integrated software solution with application and security protocols such as TLS and integrated network services (TCP/IP stack) which are all available through Atmel Studio 6 integrated development environment (IDE). The Atmel SmartConnect modules offer the ideal solutions for designers seeking to add Wi-Fi connectivity with minimal previous experience in 802.11, IP Stack, or RF. Atmel SmartConnect Wi-Fi opens the door of the Internet of Things (IoT) to the vast array of battery-powered devices and applications requiring the integration of WLAN connectivity without compromising on cost or power consumption. While we compete with other Wi-Fi modules on size, RF performance, cost, and other characteristics, the Atmel SmartConnect product family has a distinctive advantage when it comes to power consumption and power saving modes. The ATSAMW25 device is a standalone end point, where a complete small application can be executed on the module by itself.

Features

Key features with SAMW25 Wireless connectivity solution:

- Certified Wi-Fi ATWINC1500B-MU-T with SAMD21 MCU
- IEEE 802.11 b/g/n 20MHz (1x1) solution
- Single spatial stream in 2.4GHz ISM band
- Compact footprint: 33.863 x 14.882mm
- Radio:
 - Output power 802.11b /11Mbps: 17dBm ±1dB
 - 802.11g /54Mbps: 16dBm ±1dB @ EVM -28dB
 - 802.11n /72Mbps: 14dBm ±1dB @ EVM -30dB
- Application processor:
 - Atmel SAM D21 ARM Cortex M0+ based microcontroller
 - 256KB embedded Flash and 32KB SRAM
 - Full-Speed USB Device and embedded Host

- CryptoAuthentication™ ATECC508 (optional) I/O operating voltage: 2.7 to 3.6V
- Power Amplifier and On-board Switching Regulator operating voltage: 2.7 to 4.3V
- Power states supported:
 - Provision (AP/Sniffer) IDLE LISTEN
 - IDLE
 - SUSPEND
- Extreme low-power, on-chip low-power sleep oscillator
- Serial Host Interface SPI or UART
- Software Upgrade Over-the-Air (OTA)
- FCC, CE, IC, and TELEC Certified; RoHS compliant
- Security protocols; WPA/WPA2 Personal, TLS, and SSL
- Network services; DHCP, DNS, TCP/IP (IPv4), UDP, HTTP, and HTTPS

Target Applications

- IoT applications
- Smart appliances
- Multimedia streaming
- Safety and security
- Home automation
- Consumer electronics
- Industrial automation



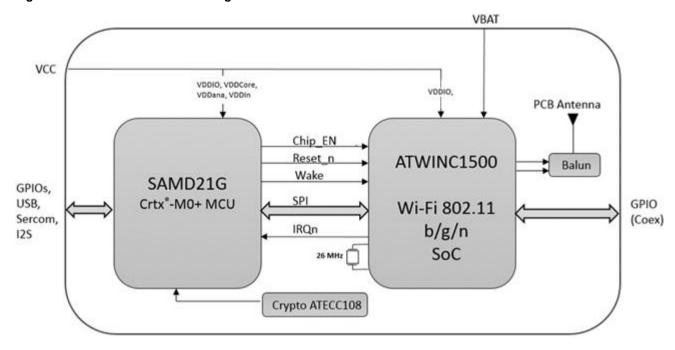
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1 Block Diagram

Figure 1-1. ATSAMW25 Block Diagram



2 Ordering Information and IC Marking

Table 2-1. Ordering Details

Atmel ordering code	Package
ATSAMW25-MR210PB	ATWINC1500 + SAM D21 module. Tray Packing.
ATSAMW25-MR510PA	ATWINC1500 + SAM D21 + ATECC508 module. Tray Packing.
ATSAMW25-XPRO	Xplained board evaluation kit



3 Pinout and Package Information

3.1 Pin Description

Figure 3-1. Pin Assignment

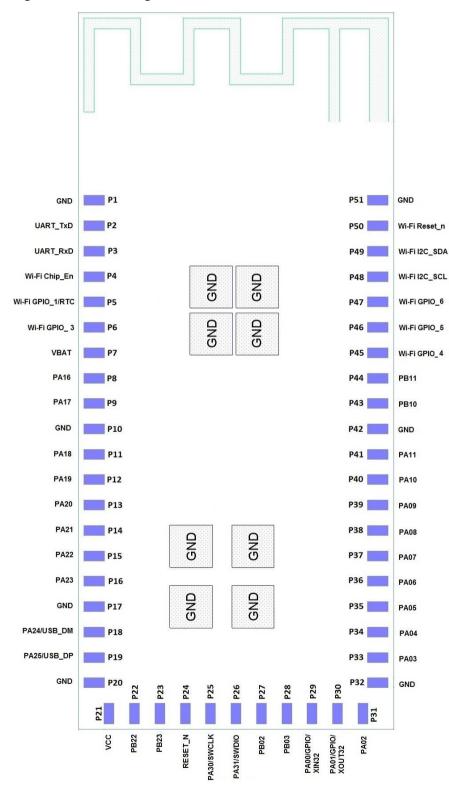




Table 3-1. Pin Description

Pin #	Pin description	I/O type	Function (default)	Programmable pull-up/-down resistor
1	GND	N/A	Common ground	
2	UART_TxD	ATWINC1500 output	Currently used only for Atmel debug. Not for customer use. Leave unconnected.	Yes – pull-up
3	UART_RxD	ATWINC1500 input	Currently used only for Atmel debug. Not for customer use. Leave unconnected.	Yes – pull-up
4	Wi-Fi Chip_En	ATWINC1500 input	Currently used only for Atmel debug. Not for customer use. Leave unconnected.	No
5	Wi-Fi GPIO_1/RTC	ATWINC1500 I/O	ATWINC1500 General purpose I/O. Can also be used to input a 32.768KHz Real Time Clock for ac- curate timing of Wi-Fi sleep intervals	Yes – pull-up
6	Wi-Fi GPIO_3	-	ATWINC1500 General purpose I/O	Yes – pull-up
7	VBAT	Power	Supply for Wi-Fi RF Power Amplifier and Internal 1.3V Switching Regulator	
8	PA16	See SAM D21G datasheet	See SAM D21G datasheet	Yes
9	PA17	See SAM D21G datasheet	See SAM D21G datasheet	Yes
10	GND	Power	Ground	
11	PA18	See SAM D21G datasheet	See SAM D21G datasheet	Yes
12	PA19	See SAM D21G datasheet	See SAM D21G datasheet	Yes
13	PA20	See SAM D21G datasheet	See SAM D21G datasheet	Yes
14	PA21	See SAM D21G datasheet	See SAM D21G datasheet	Yes
15	PA22	See SAM D21G datasheet	See SAM D21G datasheet	Yes
16	PA23	See SAM D21G datasheet	See SAM D21G datasheet	Yes
17	GND	Power	Ground	
18	PA24/USB_DM	See SAM D21G datasheet	Host Interface USB Data minus pin	Yes
19	PA25/USB_DP	See SAM D21G datasheet	Host Interface USB Data Plus pin	Yes
20	GND	Power	Ground	
21	vcc	Power	Power supply for I/O	
22	PB22	See SAM D21G datasheet	See SAM D21G datasheet	Yes
23	PB23	See SAM D21G datasheet	See SAM D21G datasheet	Yes
24	RESET_N	Input see SAM D21G datasheet	System Reset. Low level on this pin resets the entire module.	Yes
25	PA30/SWCLK	See SAM D21G datasheet	Cortex Serial Wire Debug Interface CLK	Yes



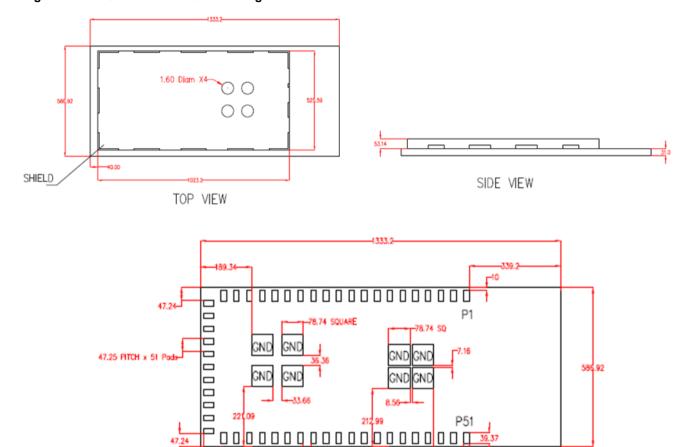
Pin #	Pin description	I/O type	Function (default)	Programmable pull-up/-down resistor
26	PA31/SWDIO	See SAM D21G datasheet	Cortex Serial Wire Debug Interface Data I/O	Yes
27	PB02	See SAM D21G datasheet	See SAM D21G datasheet	Yes
28	PB03	See SAM D21G datasheet	See SAM D21G datasheet	Yes
29	PA00/GPIO/XIN32	See SAM D21G datasheet	See SAM D21G datasheet	Yes
30	PA01/GPIO/XOUT32	See SAM D21G datasheet	See SAM D21G datasheet	Yes
31	PA02	I/O	See SAM D21G datasheet	Yes
32	GND	Power	Ground	Yes
33	PA03	See SAM D21G datasheet	See SAM D21G datasheet	Yes
34	PA04	See SAM D21G datasheet	See SAM D21G datasheet	Yes
35	PA05	See SAM D21G datasheet	See SAM D21G datasheet	Yes
36	PA06	See SAM D21G datasheet	See SAM D21G datasheet	Yes
37	PA07	See SAM D21G datasheet	See SAM D21G datasheet	Yes
38	PA08	See SAM D21G datasheet	See SAM D21G datasheet	Yes
39	PA09	See SAM D21G datasheet	See SAM D21G datasheet	Yes
40	PA10	See SAM D21G datasheet	See SAM D21G datasheet	Yes
41	PA11	See SAM D21G datasheet	See SAM D21G datasheet	Yes
42	GND	Power	Ground	
43	PB10	See SAM D21G datasheet	See SAM D21G datasheet	Yes
44	PB11	See SAM D21G datasheet	See SAM D21G datasheet	Yes
45	Wi-Fi GPIO_4	ATWINC1500 I/O	ATWINC1500 General purpose I/O	Yes – pull-up
46	Wi-Fi GPIO_5	ATWINC1500 I/O	ATWINC1500 General purpose I/O	Yes – pull-up
47	Wi-Fi GPIO_6	ATWINC1500 I/O	ATWINC1500 General purpose I/O	Yes – pull-up
48	Wi-Fi I2C_SCL	ATWINC1500 I/O	Currently used only for Atmel debug. Not for customer use. Leave unconnected.	Yes – pull-up
49	Wi-Fi I2C_SDA	ATWINC1500 I/O	Currently used only for Atmel debug. Not for customer use. Leave unconnected.	Yes – pull-up
50	Wi-Fi Reset_n	ATWINC1500 Input	Currently used only for Atmel debug. Not for customer use. Leave unconnected.	No
51	GND	Power	Ground	



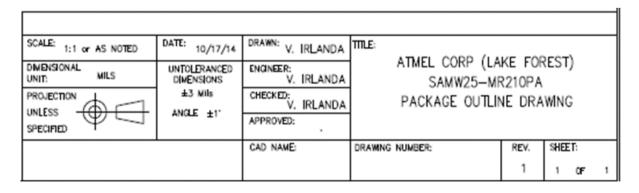
3.2 Package Description

The ATSAMW25-MR210PB package information.

Figure 3-2. SAMW25 MR210PB Package



PADS FOOTPRINT - TOP VIEW





4 Electrical Specifications

4.1 Absolute Ratings

All typical values are measured at T = 25°C unless otherwise specified. All minimum and maximum values are valid across operating temperature and voltage unless otherwise specified.

Table 4-1. Absolute Maximum Ratings

Parameters	Minimum	Maximum	Unit
VBAT power supply voltage	0	5.0	
VCC power supply voltage	0	3.63	V
Pin voltage with respect to GND and VCC	GND-0.3	VCC+0.3	
Storage temperature range	-40	+125	°C

Table 4-2. General Operating Ratings

Parameters	Minimum	Typical	Maximum	Unit
VBATT	3.0	3.6	4.3	
VCC	2.7	3.30	3.6	°C
Operating temperature range	-40	25	85	

Table 4-3. Physical Characteristics

Parameters	Value	Comments
Size	33.863 x 14.882mm	-
Connector pins pitch	See module footprint	-

Table 4-4. I/O Pins Characteristics

Characteristic	Minimum	Typical	Maximum	Unit
Input Low Voltage V _{IL}	-0.30		0.65	
Input High Voltage V _{IH}	VCC-0.60		VCC+0.30	\ \ \
Output Low Voltage VoL			0.45	V
Output High Voltage Voн	VCC-0.50			
Output Loading			20	
Digital Input Load			6	pF
Pull-up Resistor	76K	90K	104K	Ω

I/O pin characteristics for pins 5, 45, 46, and 47 (for all other I/O, see the SAM D21G datasheet).



4.2 Recommended Operating Conditions

Table 4-5. Recommended Operating Conditions

Characteristic	Symbol	Minimum	Typical	Maximum	Unit
I/O supply voltage	VCC	2.7	3.3	3.6	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \
Battery supply voltage	VBATT	3.0	3.6	4.3	V
Operating temperature		-40		85	°C

Notes: 1. I/O supply voltage is applied to the following pins: VDDIO_A and VDDIO.

4.3 DC Electrical Characteristics

Table 4-6 provides the DC characteristics for the ATSAMW25 digital pads.

Table 4-6. DC Electrical Characteristics

Characteristic	Minimum	Maximum	Unit
Input Low Voltage V _{IL}	-0.30	0.65	
Input High Voltage V _{IH}	VCC-0.60	VCC+0.30	v
Output Low Voltage V _{OL}		0.45	V
Output High Voltage V _{OH}	VCC-0.50		
Output Loading		20	nE
Digital Input Load		6	pF
Pad Drive Strength (regular pads ¹)	8	13.5	mA
Pad Drive Strength (high-drive pads ¹)	16	27	IIIA

Note: 1. The following are high-drive pads: I2C_SCL, I2C_SDA; all other pads are regular.



^{2.} Battery supply voltage is applied to following pins: VDD_BATT_PPA, VDD_BATT_PA, and VBATT_BUCK.

5 Application and Core Subsystems

5.1 Host Processor

The Atmel | SMART SAM D ARM Cortex-M0+ based microcontroller (MCU) series builds on decades of innovation and experience in embedded Flash microcontroller technology. It not only sets a new benchmark for flexibility and ease-of-use but also combines the performance and energy efficiency of an ARM Cortex-M0+ based MCU with an optimized architecture and peripheral set. The Atmel | SMART SAM D gives you a truly differentiated general-purpose microcontroller that is ideal for many low-power, cost-sensitive industrial, and consumer applications.

5.1.1 Host MCU Description

A rich set of peripherals, flexibility, and ease-of-use combined with low power consumption make the Atmel SAM D21 ideal for a wide range of home automation, consumer, metering, and industrial applications.

- ARM Cortex-M0+ based MCU running up to 48MHz
- 256KB embedded Flash and 32KB SRAM
- DMA and Event system
- Six flexible serial communication modules (SERCOM)
- Full-speed USB device and embedded Host
- 12-bit ADC (SAM D21G: 14 channels); 10-bit DAC
- Hardware touch support

5.1.2 Host MCU Key Features

- Low power consumption, down to 70µA/MHz
- Enhanced Analog Performance
 - ADC with offset and gain correction
 - Averaging, oversampling, and decimation
 - Flexible DAC
 - New low-power internal oscillators
 - ±2% accuracy over operating range
- Digital Innovations
 - Programmable Event System
 - Enhanced TC for Control Applications
 - Programmable SERCOM module
 - I²C / SPI / USART / LIN2 / IrDA
 - Full Speed USB Device and Host
 - No external components needed
 - 6-12 channel DMA with CRC module
 - PTC Hardware touch module
 - I²S module with PDM support

5.2 Wi-Fi Core Processor

ATWINC1500B has a Cortus APS3 32-bit processor. This processor performs many of the MAC functions, including but not limited to association, authentication, power management, security key management, and MSDU aggregation/de-aggregation. In addition, the processor provides flexibility for various modes of operation, such as STA and AP modes.



5.2.1 Memory Subsystem

The APS3 core uses a 128KB instruction/boot ROM along with a 128KB instruction RAM and a 64KB data RAM. ATWINC1500B also has 8Mb of flash memory, which can be used for system software. In addition, the device uses a 128KB shared RAM, accessible by the processor and MAC, which allows the APS3 core to perform various data management tasks on the TX and RX data packets.

5.2.2 Non-volatile Memory (eFuse)

ATWINC1500B has 768 bits of non-volatile eFuse memory that can be read by the CPU after device reset. This non-volatile one-time-programmable (OTP) memory can be used to store customer-specific parameters, such as MAC address; various calibration information, such as TX power, crystal frequency offset, etc.; and other software-specific configuration parameters. The eFuse is partitioned into six 128-bit banks. Each bank has the same bit map, which is shown in Figure 5-1. The purpose of the first 80 bits in each bank is fixed, and the remaining 48 bits are general-purpose software dependent bits, or reserved for future use. Since each bank can be programmed independently, this allows for several updates of the device parameters following the initial programming, e.g. updating MAC address. Refer to ATWINC1500B Programming Guide for the eFuse programming instructions.

Figure 5-1. eFuse Bit Map 1 3 1 1 7 15 **MAC ADDR** Used Flags 48 8 16 8 Bank 0 MAC ADDR G Bank 1 Bank 2 Bank 3 Bank 4 Bank 5 -128 Bits-

Atmel

6 WLAN Subsystem

The WLAN subsystem is composed of the Media Access Controller (MAC) and the Physical Layer (PHY). The following two subsections describe the MAC and PHY in detail.

6.1 MAC

6.1.1 Features

The ATWINC1500B IEEE802.11 MAC supports the following functions:

- IEEE 802.11b/g/n
- IEEE 802.11e WMM® QoS EDCA/PCF multiple access categories traffic scheduling
- Advanced IEEE 802.11n features:
 - Transmission and reception of aggregated MPDUs (A-MPDU)
 - Transmission and reception of aggregated MSDUs (A-MSDU)
 - Immediate Block Acknowledgement
 - Reduced Interframe Spacing (RIFS)
- Support for IEEE802.11i and WFA security with key management
 - WEP 64/128
 - WPA-TKIP
 - 128-bit WPA2 CCMP (AES)
- Support for WAPI security
- Advanced power management
 - Standard 802.11 Power Save Mode
 - Wi-Fi Alliance WMM-PS (U-APSD)
- RTS-CTS and CTS-self support
- Supports either STA or AP mode in the infrastructure basic service set mode
- Supports independent basic service set (IBSS)

6.1.2 Description

The ATWINC1500B MAC is designed to operate at low power while providing high data throughput. The IEEE 802.11 MAC functions are implemented with a combination of dedicated data path engines, hardwired control logic, and a low-power, high-efficiency microprocessor. The combination of dedicated logic with a programmable processor provides optimal power efficiency and real-time response while providing the flexibility to accommodate evolving standards and future feature enhancements. Dedicated data path engines are used to implement data path functions with heavy computational. For example, an FCS engine checks the CRC of the transmitting and receiving packets, and a cipher engine performs all the required encryption and decryption operations for the WEP, WPA-TKIP, WPA2 CCMP-AES, and WAPI security requirements. Control functions, which have real-time requirements, are implemented using hardwired control logic modules. These logic modules offer real-time response while maintaining configurability via the processor. Examples of hardwired control logic modules are the channel access control module (implements EDCA/HCCA, Beacon TX control, inter-frame spacing, etc.), protocol timer module (responsible for the Network Access Vector, back-off timing, timing synchronization function, and slot management), MPDU handling module, aggregation/deaggregation module, block ACK controller (implements the protocol requirements for burst block communication), and TX/RX control FSMs (coordinate data movement between PHY-MAC interface, cipher engine, and the DMA interface to the TX/RX FIFOs).ø



The MAC functions implemented solely in software on the microprocessor have the following characteristics:

- Functions with high memory requirements or complex data structures. Examples are association table management and power save queuing.
- Functions with low computational load or without critical real-time requirements. Examples are authentication and association.
- Functions which need flexibility and upgradeability. Examples are beacon frame processing and QoS scheduling.

6.2 PHY

6.2.1 Features

The ATWINC1500B IEEE802.11 PHY supports the following functions:

- Single antenna 1x1 stream in 20MHz channels
- Supports IEEE 802.11b DSSS-CCK modulation: 1, 2, 5.5, and 11Mbps
- Supports IEEE 802.11g OFDM modulation: 6, 9, 12,18, 24, 36, 48, and 54Mbps
- Supports IEEE 802.11n HT modulations MCS0-7, 20MHz, 800 and 400ns guard interval: 6.5, 7.2, 13.0, 14.4, 19.5, 21.7, 26.0, 28.9, 39.0, 43.3, 52.0, 57.8, 58.5, 65.0, and 72.2Mbps
- IEEE 802.11n mixed mode operation
- Per packet TX power control
- Advanced channel estimation/equalization, automatic gain control, CCA, carrier/symbol recovery, and frame detection

6.2.2 Description

The ATWINC1500B WLAN PHY is designed to achieve reliable and power-efficient physical layer communication specified by IEEE 802.11 b/g/n in single stream mode with 20MHz bandwidth. Advanced algorithms have been employed to achieve maximum throughput in a real world communication environment with impairments and interference. The PHY implements all the required functions such as FFT, filtering, FEC (Viterbi decoder), frequency and timing acquisition and tracking, channel estimation and equalization, carrier sensing, and clear channel assessment, as well as the automatic gain control.

6.3 Radio

6.3.1 Receiver Performance

Radio performance under typical conditions: VBAT = 3.3V; VDDIO = 3.3V; Temp.: 25°C @ RF pins

Table 6-1. Receiver Performance

Parameter	Description	Minimum	Typical	Maximum	Unit
Frequency		2,412		2,484	MHz
	1Mbps DSS		-98		dBm
Sensitivity	2Mbps DSS		-94		dBm
802.11b	5.5Mbps DSS		-92		dBm
	11Mbps DSS		-88		dBm



Parameter	Description	Minimum	Typical	Maximum	Unit
	6Mbps OFDM		-90		dBm
	9Mbps OFDM		-89		dBm
	12Mbps OFDM		-88		dBm
Sensitivity	18Mbps OFDM		-85		dBm
802.11g	24Mbps OFDM		-83		dBm
	36Mbps OFDM		-80		dBm
	48Mbps OFDM		-76		dBm
	54Mbps OFDM		-74		dBm
	MCS 0		-89		dBm
	MCS 1		-87		dBm
	MCS 2		-85		dBm
Sensitivity	MCS 3		-82		dBm
802.11n (BW=20MHz)	MCS 4		-77		dBm
(= 1. = 2 :=)	MCS 5		-74		dBm
	MCS 6		-72		dBm
	MCS 7		-70.5		dBm
	1-11Mbps DSS		0		dBm
Maximum Receive Signal Level	6-54Mbps OFDM		0		dBm
olgilai 2010i	MCS 0 - 7		0		dBm
	1Mbps DSS (30MHz offset)		50		dB
	11Mbps DSS (25MHz offset)		43		dB
Adjacent Channel	6Mbps OFDM (25MHz offset)		40		dB
Rejection	54Mbps OFDM (25MHz offset)		25		dB
	MCS 0 – 20MHz BW (25MHz offset)		40		dB
	MCS 7 – 20MHz BW (25MHz offset)		20		dB
	776-794MHz CDMA		-14		dBm
	824-849MHz GSM		-10		dBm
	880-915MHz GSM		-10		dBm
Cellular Blocker Immunity	1710-1785MHz GSM		-15		dBm
	1850-1910MHz GSM		-15		dBm
	1850-1910MHz WCDMA		-24		dBm
	1920-1980MHz WCDMA		-24		dBm

Measured at RF pin assuming 50Ω differential; RF performance guaranteed for temperature range -30 to 85°C. 1dB derating in performance at -40°C.



6.3.2 Transmitter Performance

Radio performance under typical conditions: VBAT = 3.3V; VDDIO = 3.3V; Temp.: 25°C @ RF pins

Table 6-2. Transmitter Performance

Parameter	Description	Minimum	Typical	Maximum	Unit
Frequency		2,412		2,484	MHz
	802.11b 1Mbps		18.5		dBm
	802.11b 11Mbps		19.5		dBm
Output Power ¹ ,	802.11g 6Mbps		18.5		dBm
ON_Transmit_High_Power Mode	802.11g 54Mbps		16.5		dBm
	802.11n MCS 0		17.0		dBm
	802.11n MCS 7		14.5		dBm
	802.11b 1Mbps		17.0		dBm
	802.11b 11Mbps		17.5		dBm
Output Power ¹ , ON_Transmit_Low_Power Mode	802.11g 6-18Mbps		16.0		dBm
	802.11g >18Mbps		N/A		dBm
	802.11n MCS 0-3		14.5		dBm
	802.11n >MCS 3		N/A		dBm
TX Power Accuracy			±1.5 ²		dB
Carrier Suppression			30.0		dBc
	76-108		-125		dBm/Hz
Out of Band Transmit Power	776-794		-125		dBm/Hz
	869-960		-125		dBm/Hz
	925-960		-125		dBm/Hz
	1570-1580		-125		dBm/Hz
	1805-1880		-125		dBm/Hz
	1930-1990		-125		dBm/Hz
	2110-2170		-125		dBm/Hz
Harmonia Output Dawar	2 nd			-41	dBm/MHz
Harmonic Output Power	3 _{rd}			-41	dBm/MHz

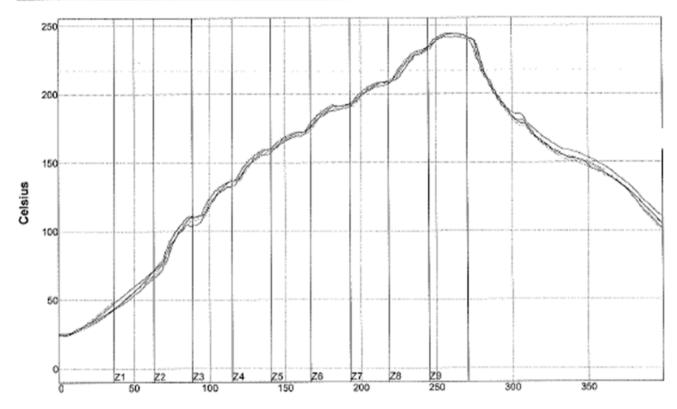
Notes: 1. Measured at 802.11 spec compliant EVM/Spectral Mask.

2. Measured after RF matching network. See reference design.



7 Recommended Reflow Profile

Setpoints (C Zone	1	2	3	4	5	6	7	8	9 1 124 12
Тор	200	140	160	180	180	210	220	265	265
Bottom	200	140	160	180	180	210	220	265	265



Seconds

PWI= 64%	Max Risi	ng Slope	Max Fall	ing Slope	Soak Tim	e 150-200C	Reflow Ti	ime /217C	Peak	Temp
III<	1.17	-41%	-3.92	-30%	74.60	-51%	54.87	-56%	242.73	-23%
<tc3></tc3>	1.19	-40%	-2.68	13%	75.03	-50%	54.99	-56%	241.73	-31%
簡 <tc4></tc4>	1.18	-41%	-4.09	-35%	74.83	-51%	54.90	-56%	244.28	-12%
<tc5></tc5>	1.19	-40%	-3.63	-20%	73.47	-55%	53.11	-64%	244.22	-13%
<tc6></tc6>	1.17	-41%	-4.04	-34%	73.63	-55%	55.09	-55%	243.92	-15%
Delta	0.02		1.41		1.56		1.98		2.55	

Process Window:

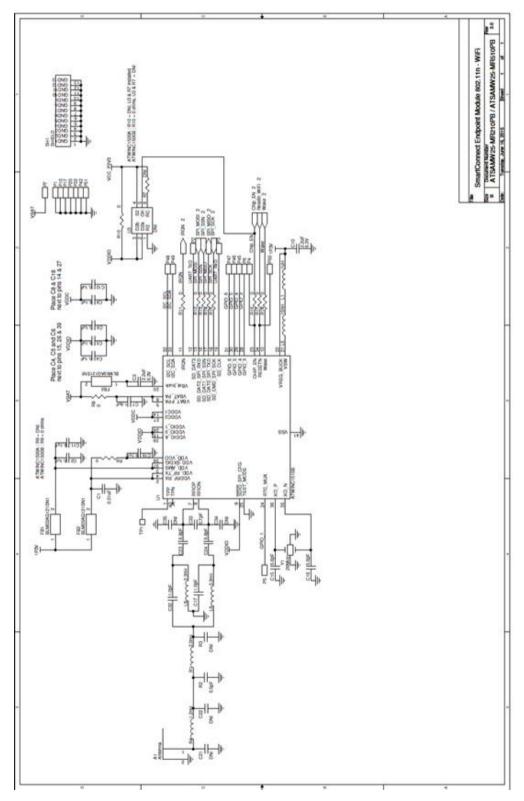
Solder Paste: RoHS				
Statistic Name	Low Limit	High Limit	Units	
• • • • • • • • • • • • • • • • • • • •	0	3	Degrees/Second	
Max Rising Slope (Target=2.0)	0	•	Degreearacond	
(Calculate Slope over 90 Seconds)				
Max Falling Slope	-6	-0.1	Degrees/Second	
(Calculate Slope over 6 Seconds)				
Soak Time 150-200C	60	120	Seconds	
Time Above Reflow - 217C	45	90	Seconds	
Peak Temperature	232	260	Degrees Celsius	



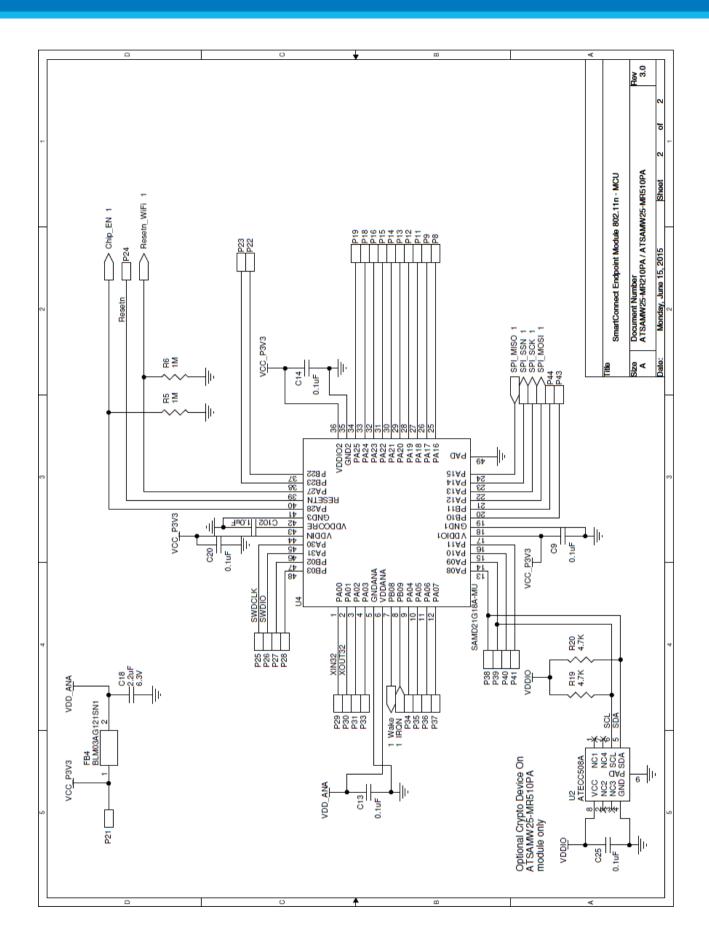
8 Module Schematic

The ATSAMW25-MR210PB/MR510PB Module schematic is shown in Figure 8-1.

Figure 8-1. ATSAMW25-MR210PB/MR510 Module Schematic









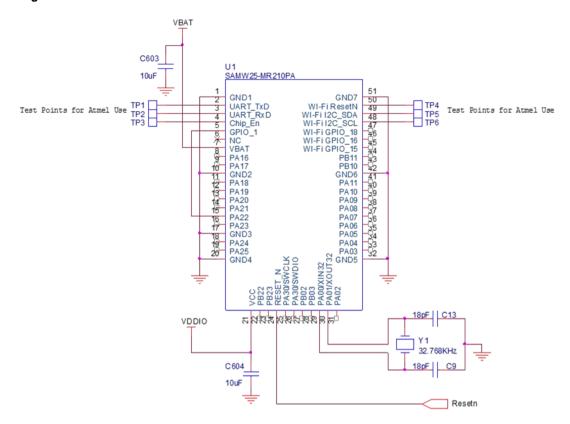
9 Bill of Materials (BOM)

19 10 10 10 10 10 10 10	Smart(SmartConnect Endpoint Module 802.11n - WiFi Revised: Monday, June 15, 2015 cAMAN-SEADER Devision: 1	12.11n - WiFi Revise	d: Monday, June 15, 2015			
Marene Pert Number Pert Number Number Pert Number Pert Number Number Pert Number Number	SAMW	25-MK51UPB REVISION: 1					
ROP (activation) Folume Description Mannal Settlement Part Number 1 All Control (activation) Activation (activation) Activation) Activation) Activation) Activation) 1 CALL (ACT GO COST COST COST COST COST COST COST COS	Bill Of	Materials					
1 41 Ancienna	ltem (2ty Reference	Value	Description	Manufacturer	Part Number	Footprint
1 CAST CAST CAST CAST CAST CAST CAST CAST	_		do de	Antenna Printed DCR Inverted F		Non-Component	DCB F
15 CLACA GRACA GRACA 1.0		Т	0.01uF	CAP.CER.0.01uF.10%.X5R.0201.10V55-125C	Murata	GRM033R61A103KA01D	0201
Q. C.			0.1uF	CAP,CER,0.1uF,10%,X5R,0201,6.3V,-55-125C	Murata	GRM033R60J104KE19D	0201
2 (2) COLOGIA 2.DE CAP (CREAL 2AP) FAND REPADLAS NYS-SERCE DISTOR COLOGIA 2 (2) COLOGIA 1.0AF CAP (CREAL 2AP) FAND REPADLAS NYS-SERCE CHARDAS CALLAS REPODLAS NYS-SERCE CHARDAS CALLAS NYS-SERCE CHARDAS CALLAS REPODLAS NYS-SERCE CHARDAS CALLAS CALLAS NYS-SERCE CHARDAS CALLAS CALLAS NYS-SERCE CHARDAS CALLAS CALLAS CALLAS NYS-SERCES CALLAS CALLAS CALLAS CALLAS CALLAS CALLAS CALLAS		C12,C13,C14,C19,C20,C25					
2 (7) (102) Louis Confects Louis Louis Louis Confects Louis		П	2.2uF	CAP,CER,2.2uF,10%,X5R,0402,6.3V,-55-85C	TDK		0402
C10.5C16 Spép Representation CAPERTS SPÉP AGO DEL 2NY SPÉTIZEC Muneam GRANDSSSCLERSBOADID C17.C32 LOPI CAPERTS 10PP AF MOD DOLI 2NY SPÉTIZEC Muneam GRANDSSSCLERSBOADID LC1.C32 DNH CAPERTS 10PP AF MOD DOLI 2NY SPÉTIZEC Muneam GRANDSSSCLERSBOADID LC2.C3.C4 SEPÉ CAPERTS 10PP AF AGO DOLI 2NY SPÉTIZEC TOK CORGOSCIERSBOADID LC3.C3.C4 SEPÉ CAPERTS 10PP AF MOD DOLI 2NY SPÉTIZEC TOK CORGOSCIERSBOADID LC3.C4 SEPÉ CAPERTS 10PP AF AGO DOLI 2NY SPÉTIZEC TOK CORGOSCIERSBOADID LC3.C4 SEPÉ CAPERTS 10PP AF AGO DOLI 2NY SPÉTIZEC TOK CORGOSCIERSBOADID LC3.C4 SEPÉ CAPERTS 10PP AF AGO DOLI 2NY SPÉTIZEC TOK CORGOSCIERSBOADID LC3.C4 SEPÉ CAPERTS 10PP AF AGO DOLI 2NY SPÉTIZEC TOK CORGOSCIERSBOADID LC3.C4 SEPÉ CAPERTO 10PP AF AGO DOLI 2NY SPÉTIZEC TOK CORGOSCIERSBOADID LC4 SEPÉ CAPERTO 10PP AF AGO DOLI 2NY SPÉTIZEC TOK CORGOSCIERSBOADID LC4 SEPÉ CAPERTO 10PP			1.0uF	CAP,CER,1.0uF,10%,XSR,0402,6.3V,-55-85C	GRM155R60J105KE19D		0402
C102 DNI CAPE (ERI, 10PF, 14/0 at PR MOD 0001, 204/55-132C) Mureas GRAM0355CLER0BADU 1 C21 C22 DNI CAPE (ERI, 10PF, 14/0 at PR MOD 0001, 204/55-132C) Mureas GRAM035SCLER0BADU 1 C22 C23 C23 C24 C25 CAPE CAPE (ERI, 10PF, 14/0 at PR MOD 0001, 204/55-135C) Mureas GRAM035SCLER0BADU 2 C32,C24 DNI CAPE (ERI, 10PF, 14/0 at PR MOD 0001, 204/55-135C) TDX CORGOGO GERGRAN WARDON 4 C32,C24 DNI CAPE (ERI, 10PF, 14/0 at PR MOD 0001, 204/55-135C) Mureas GRAM035SCLER0BADU 4 C32,C24 DNI CAPE (ERI, 10PF, 14/0 at PR MOD 0001, 204/55-135C) Mureas GRAM035SCLER0BADU 5 C34,C25 DNI CAPE (ERI, 10PF, 14/0 at PR MOD 0001, 204/55-135C) Mureas GRAM035CLER0BADU 1 L1 LG CAPE (ERI, 10PF, 14/0 at PR MOD 0001, 204/55-135C) Mureas GRAM035CLER0BADU 1 L1 LG CAPE (ERI, 10PF, 14/0 at PR MOD 0001, 204/55-135C) Mureas GRAM035CLER0BADU 2 C34/CABRA (ERI, 10PC, 10PF, 14/0 at PR MOD 0001, 204/55-13C) Mureas LOG (ERI, 10PF, 14/0 at PR MOD 0001, 204/55-13C) Mureas LOG		П	5.6pF	CAP,CER,5.6pF,+/-0.5pF,NPO,0201,25V,-55-125C	Murata	GRM0335C2A5R6DA01D	0201
1 2.2. DNI CAP, ERB, O.SpF, V.O. Info. NO.2021, 297, 5-1.3C Munera GORGANISSCEER GORGAN 2 C.23.C24 G.BgF CAP, C.R.O. SpF, V.O. IpP, NO.2021, 297, 5-5.1.3C TDK CORGANISSCEER GORGAN 2 C.24.C35 O.N CAP, C.R.O. SpF, V.O. IpP, NO.2021, 297, 5-5.1.3C TDK CORGGOOGLEGER GORGAN 2 C.43.C35 O.N CAP, C.R.O. SpF, V.O. IpP, NO.2021, 297, 5-5.1.3C TDK CORGGOOGLEGER GORGAN 4 P.13.PE2, PES, PES BLMB3AG121SNI FERRITE 120 OHM @ PLOOD RILL, SPF, 5-5.1.3C Munera SORGGRANDSSCEER GORGAN 1 LIS LIAH NO.CCTOR MULLINE PACA SPF, SAGAR, SAGAR, ALGAR, SAGAR, SAGAR, ALGAR, SAGAR,	7	П	1.0pF	CAP,CER,1.0pF,+/-0.1pF,NPO,0201,25V,-55-125C	Murata	GRM0335C1E1R0BA01J	0201
1 C32 DNI CAP, ERR Sapit-V-10 pt V-0.2001_2N-45-13C Muneas SORGENOMERSERSONDA 1 C33 0.7pf CAP, CRR Sapit-V-10 pt NRO.2001_2N-45-13C TDK CORGENOGERSERSONDA 1 C33 0.7pf CAP, CRR Sapit-V-10 pt NRO.2001_2N-45-13C TDK CORGENOGERSERSONDA 1 C33 0.7pf CAP, CRR O.2pf - V-10 pt NRO.2001_2N-45-13C TDK CORGENOGERSERSONDA 1 1.1 LIL LILM LILM LILM CORGENOGERSERSONDA 1 1.1 LIL LILM LILM LILM CORGENOGERSERSONDA 2 LIL LILM		П	DNI	CAP,CER,1.0pF,+/-0.1pF,NPO,0201,25V,-55-125C	Murata	GRM0335C1E1R0BA01J	0201
2 (23,C34 (8 BPF CAPACER (R.P.P.) (A DEP INNO QODIL 3N-55-125C TTM CORROBOSIOGISEROBBA A 2 (23,C34 (8 RPF CAPACER (A DEP / A OLDE FA NO QODIL 3N-55-125C TTM CORROBOSIOGISEROROUSDBA A 2 (24,C35 DNT CAPACER (A DEP / A OLDE FA VO ADEP / A OLDE FA CADE PA C	T		ING	CAP,CER,0.5pF,+/-0.1pF,NPO,0201,25V,-55-125C	Murata	500RGRM0335C1ER50BA0	0201
1 C33 O7 pF CAP, CER, DFF (ADDER) MODIOLIZAY, SS-132C TDIX CORREGNOGESER/RY03BBF 1 C34, C35 D07 pF CAP, CER, DFF (ADDER) MODIOLIZAY, SS-132C Mureta SOONGERMORSSICTERSOBARDAY 1 L1 L1 1.0 L1 mm L1 mm L1 mm L1 mm 2 L3, L2, L2, L2, L2, L2, L2, L2, L2, L2, L2	T	T	6.8pF	CAP,CER,6.8pF,+/-0.5pF,NPO,0201,25V,-55-125C	TDK	C0603C0G1E6R8D030BA	0201
2 (24,C25) DNI CAP_CER_LO Sip_F_J_CLIFFUNDO.DOLL3DV-55-12CC Murate BODDGGRMD035SCIERSDBAADDDOYSDBAADAT 4 (FB_FEQ_FBS_FBS_B BLMD3AG121SNI FERRITI.12D OHM @10MHH_2DORM_ACDI_JSF_12SC Murate LUMBSH_CRAMFRL 1 LL LLH POWER INDOLLOGO_LIALALOW_SADA_ALSEPREAGH GBSC Murate LUMBSH_CRAMFRL 2 LL LLH NOWER INDOLLOGO_LIALALOW_SADA_ALSEPREAGH GBSC Murate LUMBSH_CRAMFRL 2 LL_2 LPS_PAR_ED_FR_PR_S ASAM INDOLLOGO_LIALALOW_SADA_ALSEPREAGH_CRAMFRL INDOLLOGO_LIALALOW_SADA_ALSEPREAGH_CRAMFRL 2 LL_2 LPS_PAR_ED_FR_PR_S AND DALIZ LGA Module Pad_OL_TIME_CRAMFRL INDOLLOGO_LIALALOW_SADA_ALSEPREAGH_CRAMFRL 2 LL_2 LPS_PAR_ED_FR_S AND DALIZ LGA Module Pad_OL_TIME_CRAMFRL INDOLLOGO_LIALALOW_SADA_ALSEPREAGH_CRAMFRL 2 LL_2 LPS_PAR_ED_FR_S AND DALIZ CAR Module Pad_OL_TIME_CRAMFRL INDOLLOGO_CRAMFRL 2 LL_2 LPS_PAR_ED_FR_S AND DALIZ CAR MODULE PAD_OL_TIME_CRAMFRL INDOLLOGO_CRAMFRL 2 LPS_PAR_ED_FR_S ASAM ASAM ASAM ASAM 3 LPS_PAR_ED_FR_S ASAM ASAM ASAM ASAM 4 LPS_PAR_ED_FR_S <td< td=""><td></td><td>T</td><td>0.7pF</td><td>CAP,CER,0.7pF,+/-0.05pF,NPO,0201,25V,-55-125C</td><td>TDK</td><td>C0603C0G1E0R7W030BF</td><td></td></td<>		T	0.7pF	CAP,CER,0.7pF,+/-0.05pF,NPO,0201,25V,-55-125C	TDK	C0603C0G1E0R7W030BF	
FB1_FB2_FB3_FB4 BLW03AG121SNI FERRITE_120 OHM @100MHz_200m_A_020155-125C Mureta BLW03AG121SNI FERRITE_120 OHM @100MHz_200m_A_0205_3 shielded_4-Q6-55C Mureta GOALSPH21ROMFRI GOALSPH21SNI GOALSPH2	T	T	DNI	CAP,CER,0.5pF,+/-0.1pF,NPO,0201,25V,-55-125C	Murata	500RGRM0335C1ER50BA01D07S0R5AV4T	
4 FB1,PB2,PB3,FB4 BUMDAGADISTANI POWER INDUCTOR, AUNITIBARE JODINA, 2004, 20-125. BUMDAGADISTANI BUMDAGADISTANI 1 L1 L1 L1 IUNT POWER INDUCTOR, AUNITIBARE, 258, 250mA, Q-e80 100MHz, DAG2 Murata LQMISBNIADMRRIL 1 L1 L1 L1 INDUCTOR, AUNITIBARE, 258, 250mA, Q-e80 100MHz, DAG2 Tally Vuden HK026053SNBCT 1 L1 L1 L1 LNA PRAGADIS PARA, AU 2.Ant, Q-a128650MHz, SRF-8. LGHz, D2D1, -SS-125C Tally Vuden HK02605SSNBCT 1 P15,P28,P29,P30,P24,P32,P32 RAGADIS PARA, AU 2.Ant, Q-a128650MHz, SRF-8. LGHz, D2D1, -SS-125C Tally Vuden HK02605SSNBCT 1 R12,P28,P29,P30,P32,P32,P32,P32 RAGADIS PARA, AU 2.Ant, Q-a138650MHz, SRF-8. LGHz, D2D1, -SS-125C Tally Vuden HK02605SSNBCT 1 R1 R2 CAP, CRR, D.S.P-I-I-I-I-I-I-I-I-I-I-I-I-I-I-I-I-I-I-I	Т	十					
1 1.1 POWER BY TOOL OF AUTHOR	Т	T	BLM03AG121SN1	FERRITE,120 OHM @100MHz,200mA,0201,-55-125C	Murata	BLM03AG121SN1	0201
1 IS ISH INDUCTORA MUNITIONED SAS SORMA, Qu-8ge 100M Hz, Qu-92 Munata PLOS STANDARD ILD STANDARD ILD STANDARD ILD STANDARD INDUCTORA MUNITIONED SAS SORMA, Qu-8ge 100M Hz, Qu-92 Inductor Standard	T	T	1nH	POWER INDUCTOR,1uH,20%,940mA,0.125ohms,0603,shielded,-40-85c	Murata	LQM18PN1R0MFRL	0903
4 PART PROPRIED RESIDENT 9.3 mm Innucrot, 2.3 mm, 7.0 mm, 4.1 mm Innucrot, 2.3 mm, 7.0 mm, 7.1 mm, 4.1 mm Innucrot, 2.3 mm, 7.0 mm, 7.1 mm, 7.1 mm, 7.1 mm Innucrot, 2.3 mm, 7.0 mm, 7.1 mm, 7.1 mm, 7.1 mm, 7.1 mm, 7.1 mm Innucrot, 2.3 mm, 7.0 mm, 7.1 mm,			15nH	INDUCTOR,Multilayer,15nH,5%,350mA,Q=8@100MHz,0402	Murata	LQG15HS15NJ02D	0402
PSP 10.0 PL 20.0 PL	Т	\top	0.50 AAG		iaiyo ruqeri	Man Company	0201 040 0 7mm/ 7mm
P31,P32,P32,P32,P32,P32,P32,P32,P32,P32,P32	T	\top	7AU_0./X1.2	LGA MOGUIE Pau, U./IIIII x 1.ZIIIIII		Nort-Component	PAD_U./IIIIIXI.ZIIIIII
P31_P32_P35_P6_P31_P32, P32_P32_P32_P6_P32_P32_P32_P32_P32_P32_P32_P32_P32_P32		015 015 017 018 010 020					
P32/P28/P29/P30,P31,P32, P33/P4,P32/P32,P32,P32,P32,P32,P32,P32,P32,P32,P32,		P21 P22 P23 P24 P25 P26					
P33,P34,P35,P36,P37,P38, P39,P40,P42,P43,P44, P39,P40,P41,P42,P43,P44, P39,P40,P41,P42,P43,P44, P45,P48,P49,P50, P45,P48,P49,P40,P48,P49,P50, P45,P48,P48,P48,P48,P48,P48,P48,P48,P48,P48		P27 P28 P29 P30 P31 P32					
P39_P40_P41_P42_P43_P44, Pa8_P43_P44, Pa8_P43_P48_P43_P44, Pa8_P43_P44, Pa8_P43_P44, Pa8_P43_P44, Pa8_P43_P44, Pa8_P43_P44, Pa8_P43_P44, Pa8_P43_P44, Pa8_P43_P48_P44, Pa8_P43_P44, Pa8_P43_P4		P33,P34,P35,P36,P37,P38.					
P51 P45,P46,P47,P48,P49,P50, Inductor,2 OnH,4/-0.2nH,Q=13@500MHz,SR=8.1GHz,0201,-55-125C Taiyo Yuden HKQ0603S2N0C-T 1 R1 CAP,CER,Q.5P,+/-0.1PF,NPO,0201,25V,-55-125C Murata GRM033SCIERS0BA0 1 R2 CAP,CER,Q.5P,+/-0.1PF,NPO,0201,25V,-55-125C Murata GRM033SCIERS0BA0 1 R3 DNI CAP,CER,Q.5P,+/-0.1PF,NPO,0201,25V,-55-125C Murata GRM033SCIERS0BA0 1 R4 1.2nH Inductor,1.2nH,+/-0.1nH,-1-0.1H,-1.24@500MHz,SRF=GGHz,0201,-55-125C Murata LQP03TNINI2B02D 1 R7 DNI RESISTOR,Thick Film,1M,5%,0201 Vishay CRCW0201-105J 1 R7 DNI RESISTOR,Thick Film,2M,5%,0201 Vishay CRCW0201-105J 1 R7 BNI RESISTOR,Thick Film,4.7K,5%,0201 Vishay CRCW0201-105J 1 R19,R20 4.7K RESISTOR,Thick Film,4.7K,5%,0201 Vishay CRCW0201-472J 2 R19,R20 4.7K RESISTOR,Thick Film,4.7K,5%,0201 Vishay CRCW0201-472J 3 BHIBLD Shield ATMINICISIOR Nin		P39 P40 P41 P42 P43 P44					
P51 CONH Inductor,2.0nH,+/-0.2nH,Q=13@500MHz,SRF=8.1GHz,0201,-55-125C Taiyo Yuden HX00603S2N0C-T 1 R1 CONH Inductor,2.0nH,+/-0.2nH,Q=13@500MHz,SRF=8.1GHz,0201,-55-125C Taiyo Yuden HX00603S2N0C-T 1 R2 0.5pF CAP,CER,0.5pF,+/-0.1pF,NP0,0201,25V,-55-125C Murata GRN0335C1ER50BA0 1 R3 DNI RESISTOR,FINEK Fillm,1M,C-4.26 Murata GRN0335C1ER50BA0 2 R5,R6 Mu RESISTOR,FINEK Fillm,1M,C-5.6001 Vishay CRCW0201-105J 1 R7 DNI RESISTOR,TINEK Fillm, Ohm,0201 Vishay CRCW0201-105J 1 R7 RESISTOR,TINEK Fillm, Ohm,0201 Vishay CRCW0201-105J 1 R14,R15,R16,R17,R18 RESISTOR,TINEK Fillm, Ohm,0201 Vishay CRCW0201-105J 2 R19,R20 ATK RESISTOR,TINEK Fillm, Ohm,0201 Vishay CRCW0201-105J 3 R14,R15,R16,R17,R18 ATK RESISTOR,TINEK Fillm, A.7K,5%,0201 Vishay CRCW0201-105J 4 ATH ATK ATK ATK ATK <td></td> <td>P45,P46,P47,P48,P49,P50,</td> <td></td> <td></td> <td></td> <td></td> <td></td>		P45,P46,P47,P48,P49,P50,					
1 R1 R2 Cap,CER,O.3DH,+/-O.2DH,A-0.2DH,2SY-35-12SC Murata GRM033SCIERS0BAD 1 R3 DNI CAP,CER,O.3DF,A-Y-O.1DF,INPO,0201,2SY-35-12SC Murata GRM033SCIERS0BAD 1 R3 DNI CAP,CER,O.3DF,A-Y-O.1DF,INPO,0201,2SY-35-12SC Murata GRM033SCIERS0BAD 1 R5,R6 JAH Inductor,1.2CH,A-Y-O.1DH,A=14@S00MHz,SRF=6GHz,0201,55-12SC Murata GRM032DL105J 1 R7 DNI RESISTOR,TRICK Fillm,JA-A=14@S00MHz,SRF=6GHz,0201,55-12SC Vishay CRCW0201-105J 1 R7 DNI RESISTOR,TRICK Fillm,JA-SK,0201 Vishay CRCW0201-105J 1 R14,R15,R16,R17,R18 A.7 RESISTOR,TRICK Fillm,JA-7K,SK,0201 Vishay CRCW0201-105J 2 R19,R20 A.7 RESISTOR,TRICK Fillm,A-7K,SK,0201 Vishay CRCW0201-472J 3 R1H DNI Test Point,Surface Mourt,0.030°sq. Atmel ATMINC1510B 1 TP1 <td></td> <td>P51</td> <td></td> <td></td> <td></td> <td></td> <td></td>		P51					
1 R2 0.5 pF CAP,CER,0.5 pF,+/-0.1 pF,NPO,0201,25V,-55-125C Murata GRM0335CIERS0BA0 1 R3 DNI CAP,CER,0.5 pF,+/-0.1 pF,NPO,0201,25V,-55-125C Murata GRM0335CIERS0BA0 1 R4 1.2 nH Inductor,1.2 nH,+/-0.1 nH,Q=14@500MHz,SRF=6GHz,0201,-55-125C Murata LQP03TN1N2B02D 2 R5,R6 JM RESISTOR,Thick Film,JM,5%,0201 Vishay CRCW0201-105J 1 R7 DNI RESISTOR,Thick Film,JM,5%,0201 Vishay CRCW0201-105J 1 R8,R9,R10,R1,R12,R13 0 RESISTOR,Thick Film,JM,5%,0201 Vishay CRCW0201-472J 2 R19,R20 4.7K RESISTOR,Thick Film,JM,5%,0201 Vishay CRCW0201-472J 3 R19,R20 A.7K RESISTOR,Thick Film,JM,5%,0201 Vishay CRCW0201-472J 4 A.7K RESISTOR,Thick Film,JM,5%,0201 Vishay CRCW0201-472J 5 A.7K A.7K RESISTOR,Thick Film,JM,7%,5%,0201 Vishay ATMINCT10B 1 VI ATECCS08A IC, Memony, Crypto Authentication, BUPIN			2.0nH	Inductor,2.0nH,+/-0.2nH,Q=13@500MHz,SRF=8.1GHz,0201,-55-125C	Taiyo Yuden	HKQ0603S2N0C-T	0201
1 R3 DNI CAP,CER,0.5 pF, y-0.1pF,NPO,0201,25V-55-125C Murata GRM0335CIERS0BAD 1 R4 1.2nH Inductor,1.2nH, y-0.1nH, Q=14@500MHz,SRF=6GHz,0201,55-125C Murata LQP03TM1N2B02D 2 R5,R6 1M RESISTOR,Thick Film,1M,5%,0201 Vishay CRCW0201-105J 1 R7 DNI RESISTOR,Thick Film,0 ohm,0201 Panasonic RRJ-GN08D0-105J 1 R8,R9,R10,R11,R12,R13 0 RESISTOR,Thick Film,0 ohm,0201 Vishay CRCW0201-105J 2 R19,R20 4.7K RESISTOR,Thick Film,4.7K,5%,0201 Vishay CRCW0201-472J 3 SHIELD Shield Shield Non-Component Atmel Atmel 1 TP1 DNI Test Point,Surface Mount,0.030"sq. Atmel Atmel Atmel 1 U.2 ATECC508A IC, Memory, Crypto Authentication, BUDFN Atmel Atmel Atmel 1 U.3 DNI IC, Load Switch,1.8V-12V In,RDSon=0.3ohm@2.5V,SC70-6 Vishay S11865DDL 1 U.4 SAMD21G18			0.5pF	CAP,CER,0.5pF,+/-0.1pF,NPO,0201,25V,-55-125C	Murata	GRM0335C1ER50BA0	0201
1 R4 1.2hH Inductor,1.2nH,+/-0.1nH,Q=14@500MHz,SRF=6GHz,0201,-55-125C Murata LQP03TNIN2B02D 2 R5,R6 1M RESISTOR,Thick Film,1M,5%,0201 Vishay CRCW0201-105J 1 R7 DNI RESISTOR,Thick Film,1M,5%,0201 Vishay CRCW0201-105J 1 R8,R9,R10,R11,R12,R13 0 RESISTOR,Thick Film,0 ohm,0201 Panasonic RN-1GN0R00C 1 R14,R15,R16,R17,R18 7 RESISTOR,Thick Film,4.7K,5%,0201 Vishay CRCW0201-472J 1 SH1 DNI Test Point,3surface Mount,0.030"sq. Atmel Armel Armel 1 V1 ATECC50RA (C, WiFi + 8GB FLASH 40QRN Atmel Atmel Atmel 1 U3 DNI (C, Load Switch,1.8V-12V In,RDSon=0.3ohm@2.5V,SC70-6 Vishay S11865DDL 1 U4 SAMD21G18A-MU MCU, MCU, Atmel Atmel Atmel 1 V1 V1 SAMD21G18A-MU MCU, Atmel Atmel Atmel 1 V1 V2 </td <td></td> <td></td> <td>DNI</td> <td>CAP,CER,0.5pF,+/-0.1pF,NPO,0201,25V,-55-125C</td> <td>Murata</td> <td>GRM0335C1ER50BA0</td> <td>0201</td>			DNI	CAP,CER,0.5pF,+/-0.1pF,NPO,0201,25V,-55-125C	Murata	GRM0335C1ER50BA0	0201
2 R5,R6 IM RESISTOR,Thick Film,1M,5%,0201 Vishay CRCW0201-105J 1 R7 DNI RESISTOR,Thick Film,1M,5%,0201 Vishay CRCW0201-105J 11 R8,R9,R10,R11,R12,R13 0 RESISTOR,Thick Film,0 ohm,0201 Panasonic ER1-IGN0R00C 1 R14,R15,R16,R17,R18 7 RESISTOR,Thick Film,4.7K,5%,0201 Vishay CRCW0201-472J 1 SH1 DNI Test Point,3surface Mount,0.030"sq. Atmel Armel Armel 1 U1 ATWINC1510B IC, WiFi + 8GB FLASH 40QFN Atmel Armel ATWINC1510B 1 U2 ATECC50RA IC, Load Switch,1.8V-12V In,RDSon=0.3ohm@2.5V,SC70-6 Vishay S11865DDL 1 U4 SAMD21G18A-MU MCU, MCU, Atmel Atmel Atmel 1 V1 V1 SAMD21G18A-MU MCU, Atmel Atmel Atmel 1 V1 V1 SAMD21G18A-MU MCU, Atmel Atmel Atmel			1.2nH	Inductor,1.2nH,+/-0.1nH,Q=14@500MHz,SRF=6GHz,0201,-55-125C	Murata	LQP03TN1N2B02D	0201
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1 U3 DNI IC, Load Switch,1.8V-12V In,RDSon=0.3ohm@2.3V,SC70-6 Vishay Si1865DDL 1 U4 SAMD21G18A-MU MCU, Atmel SAMD21G18A-MU 1 Y1 26MHz CRYSTAL,26MHz,CL=7PF,10ppm,-40-85C,ESR=50,3.2x.5mm Tatien A0183-X-002-3	T	\neg	ATECC508A	IC, Memory, Crypto Authentication, 8UDFN	Atmel	ATECC508A-MAHWF-T	8UDFN
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1 Y1 26MHz CRYSTAL,26MHz,CL=7pF,10ppm,-40-85C,ESR=50,3.2x2.5mm Tatien A0183-X-002-3	П	П	SAMD21G18A-MU	Mcu,	Atmel	SAMD21G18A-MU	48QFN
			26MHz	CRYSTAL, 26MHz, CL=7pF, 10ppm, -40-85C, ESR=50, 3.2x2.5mm	Tatien	A0183-X-002-3	2.0mm x 2.5mm



10 Application Schematic

Figure 10-1. Connections for the ATSAMW25



The basic power supply connections for the ATSAMW25 module are shown in Figure 10-1. The test points shown (TP1 – TP6) should be added in case Atmel is required to debug the design.

The Wi-Fi chip can use its own internal oscillator for a Real Time Clock (RTC) or it can use an external 32.768KHz clock provided on the RTC pin. Using an external clock derived from a crystal oscillator can be used as a more accurate sleep timer for the Wi-Fi chip than its own internal oscillator. This in turn can reduce sleep current. If power consumption during sleep is a priority then a 32.768KHz crystal can be added to the SAM D21 module as shown in the reference design. The design shown above displays a connection from pin 15 (PA22) to pin 5 (GPIO_1).

GPIO_1 is the input pin for the Wi-Fi's Real Time Clock. PA22 can be configured to output a 32.768KHz RTC clock – derived from the 32.768KHz crystal - to be used as the source for the Wi-Fi's RTC. If cost is a priority versus power consumption, then the 32.768KHz crystal can be left off of the design and the PA22 – GPIO_1 connection can be deleted.



11 Design Guidelines

It is critical to follow the recommendations listed below to achieve the best RF performance:

- When the module is placed on the motherboard, a provision for the antenna must be made. There should be nothing under the portion of the module which contains the antenna. This means the antenna should not be placed directly on top of the motherboard PCB. This can be accomplished by, for example, placing the module at the edge of the board such that the module edge with the antenna extends beyond the main board edge by 6.5mm. Alternatively, a cutout in the motherboard can be provided under the antenna. The cutout should be at least 22 x 6.5mm. Ground vias spaced 2.5mm apart should be placed all around the perimeter of the cutout. No large components should be placed near the antenna.
- Keep away from antenna, as far as possible, large metal objects to avoid electromagnetic field blocking
- Do not enclose the antenna within a metal shield
- Keep any components which may radiate noise or signals within the 2.4 2.5GHz frequency band far away from the antenna, or better yet, shield those components. Any noise radiated from the main board in this frequency band will degrade the sensitivity of the module.
- The main board should have a solid ground plane. Each ground pin of the module (including each of the
 center ground pads) should have a via placed either in the pad or right next to the pad going down to the
 ground plane.
- Place a 10μF decoupling capacitor from VBAT to ground right next to pin 7. Place another 10μF capacitor from VCC to ground right next to pin 21.
- Contact Atmel for assistance if any other placement is required



12 Reference Documentation and Support

12.1 Reference Documents

Atmel offers a set of collateral documentation to ease integration and device ramp.

The following list of documents available on Atmel web or integrated into development tools.

Table 12-1. Reference Documents

Title	Content
Datasheet	This document
Design Files	User Guide, Schematic, PCB layout, Gerber, BOM, and System notes on: RF/Radio Full Test Report, radiation pattern, design guidelines, temperature performance, ESD.
Package	How to use package: Out of the Box starting guide, HW limitations and notes, SW Quick start guidelines.
Platform Getting started Guide	Best practices and recommendations to design a board with the product, including: Antenna Design for Wi-Fi (layout recommendations, types of antennas, impedance matching, using a power amplifier etc.), SPI/UART protocol between Wi-Fi SoC and the Host MCU.
HW Design Guide	Integration guide with clear description of: High level Arch, overview on how to write a networking application, list all API, parameters and structures. Features of the device, SPI/handshake protocol between device and host MCU, with flow/sequence/state diagram, timing.
SW Design Guide	Explain in details the flow chart and how to use each API to implement all generic use cases (e.g. start AP, start STA, provisioning, UDP, TCP, http, TLS, p2p, errors management, connection/transfer recovery mechanism/state diagram) - usage and sample application note.

For a complete listing of development-support tools and documentation, visit http://www.atmel.com/ or contact the nearest Atmel field representative.

12.2 Related Documents

[1] ATSAM D21 Datasheet:

Web page: http://www.atmel.com/products/microcontrollers/arm/sam-d.aspx?tab=documents.

Document: Atmel SAM D21 Datasheet (.pdf file).

Then select the required device (ATSAMD21E18A) and get the latest datasheet (.pdf file).

- [2] ATWINC1500B Datasheet.
- [3] ATSAM W25 Network Controller Programming Guide.
- [4] ATSAM W25 Starter Kit User Guide.



13 Revision History

Doc Rev.	Date	Comments
42618A	11/2015	Initial document release.







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