User's Manual
PSC autaniNet Module

Model Number: 1000179-01

Document Number: 80308

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Version	Date	Changed By	Revision Description
1	10-23-2019	MEP	Preliminary

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1. Description

The PSC autaniNet Module provides a cost-effective RF transceiver for 2.4 GHz IEEE 802.15.4 wireless networks. The PSC autaniNet Module is based on the Ember EM358X System-on-a-Chip (SoC) and it has been designed to support larger, denser, sleepier, more mobile, secure, and resilient wireless networks.

Features:

- Designed for autaniNet wireless networks
- Miniature footprint: 0.940" x 1.120"
- Wire antenna
- 15 RF channels
- Integrated hardware support for Ember development environment
- SIF debug port
- AES 128-bit encryption
- Low power consumption
- FCC and IC Certified (pending)
- 512KB Flash Memory
- 64KB RAM
- 32-bit ARM Cortex-M3 microprocessor
- RoHS Compliant
- **Made in USA**

2. Ordering Information

Part Number	Description
1000179-01	PSC autaniNet Module

3. Specifications

3.1 Absolute Maximum Ratings

Note: Exceeding the maximum ratings may cause permanent damage to the module.

Parameter	Min	Max	Unit
Power Supply Voltage (V_{DD})	2.1	3.6	V
Voltage on any digital pin	-0.3	V_{DD}+0.3	V
Storage Temperature	-40	125	°C

3.2 Recommended Operating Conditions

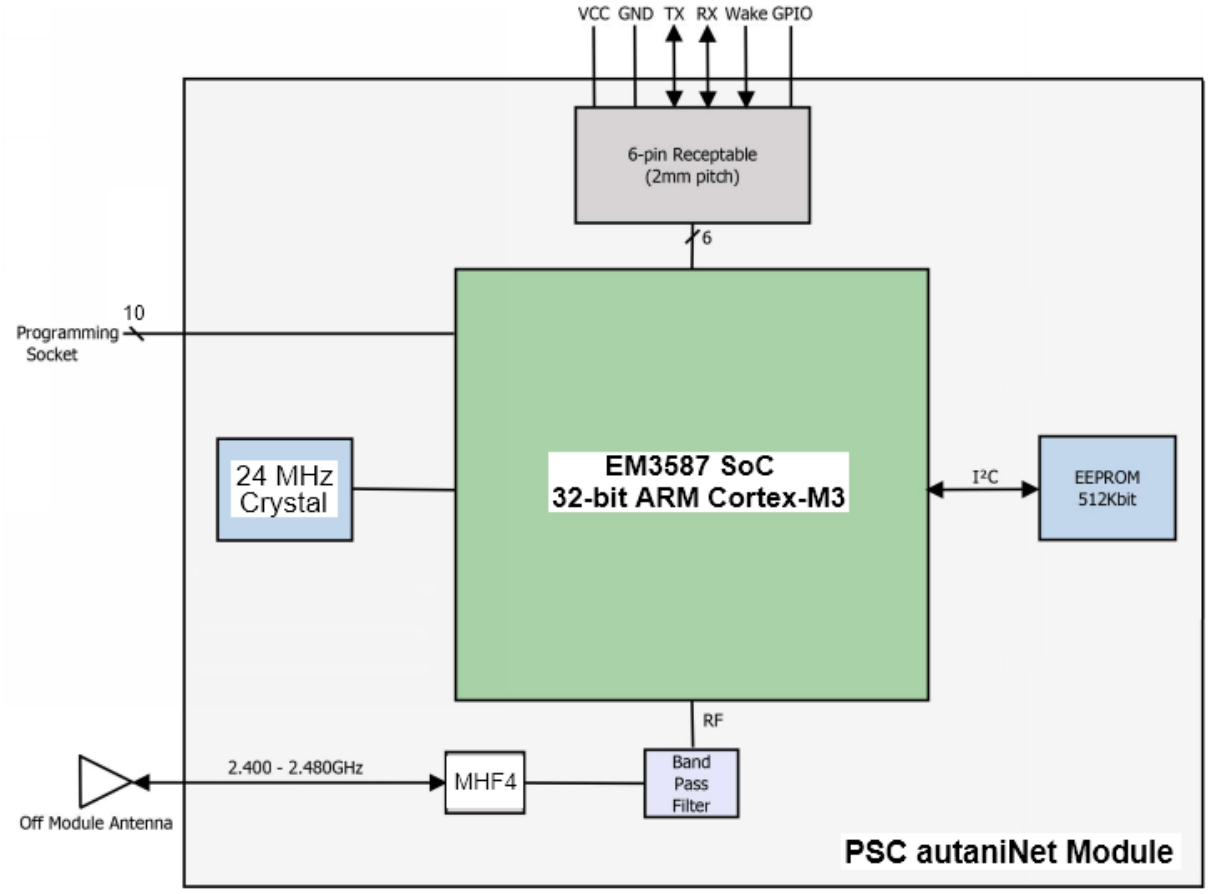
Note: Operating conditions outside those listed here may cause inappropriate behavior.

Parameter	Min	Typ.	Max	Unit
Power Supply Voltage (V_{DD})	2.5	3.3	3.6	V
Operating Temperature	0	25	70	°C
Logic Input Low Voltage	0		0.2xV_{DD}	V
Logic Input High Voltage	0.8xV_{DD}		V_{DD}	V
RF Tx Power (Ch11-Ch25)			+8	dBm

3.3 Electrical Specifications

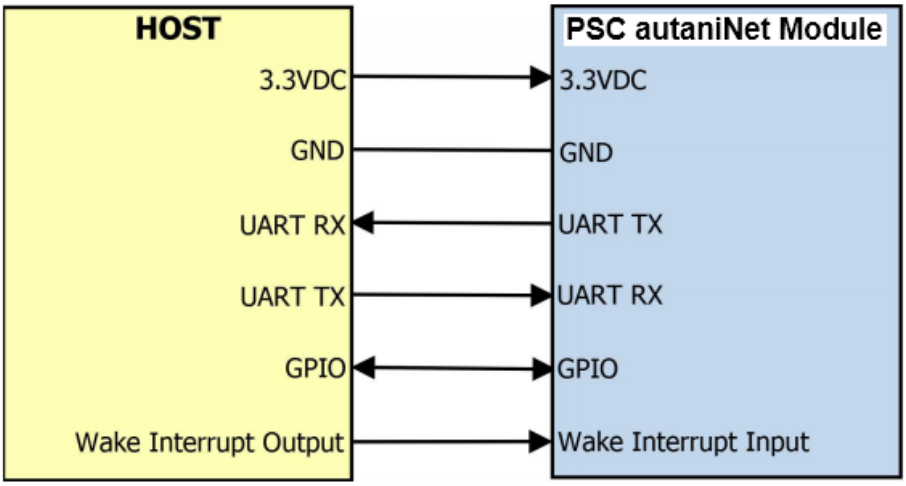
Parameter	Min	Typ.	Max	Unit
General Characteristics				
RF Frequency Range	2.400		2.480	GHz
Data Rate		250		Kbps
Processor core frequency		12		MHz
Flash Memory		512		KB
RAM		64		KB
Power Consumption				
Transmit Mode		45.0		mA
Receive Mode		30.0		mA
Processor Only Mode		8.5		mA
Deep Sleep Mode			1	uA
Logic Characteristics				
Logic Input High	$0.8xV_{DD}$		V_{DD}	V
Logic Input Low	0		$0.2xV_{DD}$	V
Logic Output High	$0.82xV_{DD}$		V_{DD}	V
Logic Output Low	0		$0.18xV_{DD}$	V
Output Source/Sink Current			4	mA
Output Source/Sink Current for high current pad: PA6,PA7,PB6,PB7,PC0			8	mA
Logic High Input Current			0.5	uA
Logic Low Input Current			-0.5	uA
Input Pull-up Resistance	24	29	34	kΩ
Input Pull-down Resistance	24	29	34	kΩ

4. Block Diagram



5. Host Interface

The PSC autaniNet Module incorporates one Universal Asynchronous Receiver/Transmitter (UART) interface dedicated to the host for communication to and from the module. Also available is one General Purpose Input/Output (GPIO) and a WAKE interrupt input used to wake up the module from low power sleep mode. The GPIO and WAKE interface connections may or may not be used for this application. The host supplies 3.3VDC and GND to power the module.



6. Capabilities

The PSC autaniNet Module was designed to be used with 3rd party products such as Wired Wall Switches and Motion Sensors. The PSC autaniNet Module provides a cost-effective RF transceiver for 2.4 GHz IEEE 802.15.4 ZigBee wireless networks. The PSC autaniNet Module is based on the Ember EM358x System-on-a-chip (SoC) and has been designed to support larger, more secure, and resilient wireless networks. The EM358x is a 32-bit ARM Cortex-M3 Processor with a 2.4GHz IEEE 802.15.4-2003 RF transceiver.

The on-board EM358x (SoC) provides 24 GPIO ports to support all on-board functions such as a Push-Button Switch, two LED's, Flash Memory for over-the-air firmware updates and connections for programming and debugging. All GPIO's are configurable as input, output, or bi-directional and have an internal pull-up or pull-down. The Push-Button Switch and LED's are used during installation to commission each device on the wireless network.

The PSC autaniNet Module is powered from a 3.3VDC power source provided from the 3rd Party product (Occupancy Sensor, Wall Switch, etc.) and communicates to the 3rd Party product via a 2-wire serial connection to control the operation of the 3rd Party product – such as controlling a relay in an Occupancy Sensor or Wall Switch.

The PSC autaniNet Module uses a wire antenna connected to J1 (IPEX4/MHF4 RF connector) to communicate wirelessly in a mesh network topology using the ZigBee protocol (2.4GHz ISM band).

The PSC autaniNet Module contains a shield that covers the RF circuitry.

7. Connector Pin Assignments

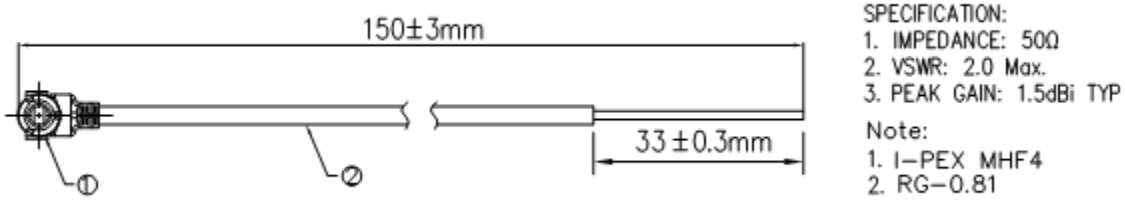
J1 (Off-Module Antenna Connector)			
Pin	***Name***	***Type***	***Description***
1	Ext. Ant.	I/O	U.FL Off-Module Antenna Connector

J2 (10-pin Program/Debug Header)			
Pin	***Name***	***Type***	***Description***
1	VDD	Input	+3.3VDC power supply to module
2	PC2/JTDO	Output	Program/Debug JTAG Data-Out
3	PC0/JRST	Input	Program/Debug JTAG Reset
4	PC3/JTDI	Input	Program/Debug JTAG Data-In
5	GND	GND	Power supply ground reference
6	JCLK	Input	Program/Debug JTAG Clock
7	PC4/JTMS	Input	Program/Debug JTAG Mode Select
8	RST#	Input	Program/Debug Processor Reset
9	PA4/PTIEN	Output	Program/Debug Packet Trace Interface Enable
10	PA5/PTIDATA	Input	Program/Debug Packet Trace Interface Data

J3 (6-pin Receptacle) – Seral Communication			
Pin	***Name***	***Type***	***Description***
1	GND	GND	Power supply ground reference
2	VDD	Input	+3.3VDC power supply to module
3	TX	Output	UART interface transmit
4	RX	Input	UART interface receive
5	GPIO	I/O	General purpose input/output
6	WAKE	Input	Module wake-up interrupt signal

8. Antenna

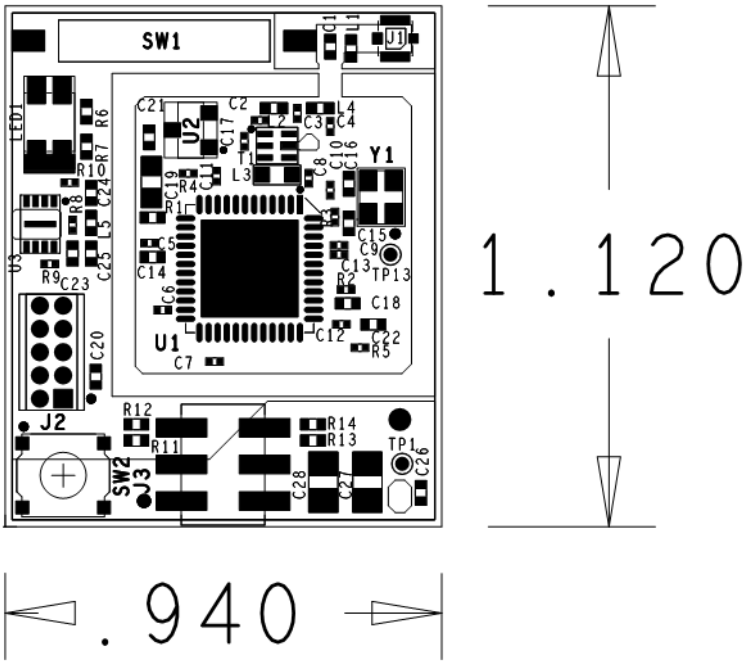
The PSC autaniNet Module uses a wire antenna connected to J1 (I-PEX, MHF4 connector). The PSC autaniNet Module is FCC certified for use with the antenna shown below.



FCC Approved Antenna Specifications	
Manufacturer	Shenzhen Taida Century Technology Co., Ltd
Part Number	WF2400-081IPEX
Type	Whip Straight (Wire)
Overall Wire Length	150mm +/-3mm
Material of Radiator	Cu
Connector	IPEX4 (MHF4)
S.W.R.	2.0 max.
Frequency	2400 ~ 2500 MHz
Gain (typical)	1.5dBi +/-0.7
Impedance	50 ohm
Polarization	Linear
Operating Temperature	-40°C ~ +65°C
Storage Temperature	-40°C ~ +80°C

NOTE: Use of alternate antenna types or the same type with higher gain is not permitted without additional testing and FCC approval.

9. Dimensions



10. Certifications

10.1 FCC – United States

The PSC autaniNet Module complies with Part 15 of the Federal Communications Commission rules and regulations. To continue compliance with Part 15 the end user MUST include a visible label on the outside of the final product which indicates the internal radio module is FCC approved. The exterior label must use wording: "This device contains: FCC ID: V8NPSC1000179". To meet the section 15.209 emissions requirements in the restricted bands of section 12.205, the transceiver transmitter power for the EM358X can be set no higher than +8dBm for channels 11-25 (channel 26 to be disabled). Any modifications to the PSC autaniNet Module may violate the rules of the FCC and make operation of the module unlawful. The user is responsible for obtaining compliance for unintentional radiators on the final product.

FCC Statement:
This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

NOTE 1: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/ TV technician for help.

NOTE 2: The PSC autaniNet Module complies with the FCC RF radiation exposure limits set forth for an uncontrolled environment. The PSC autaniNet Module must be installed and/or operated with a minimum distance of 8 in. (20 cm.) between the antenna and people.

FCC Caution: Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

10.2 IC – Canada

IC Statement:

The PSC autaniNet Module is IC certified. The labeling requirements for Industry Canada are similar to those for FCC. A visible label must be placed on the outside of the final product which indicates the internal radio module is IC approved. The exterior label must use wording: "This device contains: IC: 7737A-PSC1000179". The user is responsible for the end product complying with ICES-003 (Unintentional Radiators).

This device complies with ISED Canada license-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes: (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

11. Handling and Storage

11.1 Alterations

Any and all alterations to the PSC autaniNet Module are highly discouraged and are completed at the consumer's risk. Such actions will invalidate any manufactures warranty and potentially cause the module to violate FCC and IC certifications.

11.2 Handling

The PSC autaniNet Module contains extremely sensitive electronic circuitry. Handle board with proper ESD protection at all times.

11.3 Storage

Store module in clean and dry environment. See *Electrical Specifications* for additional details.