Data Sheet: JN5139-xxx-Myy

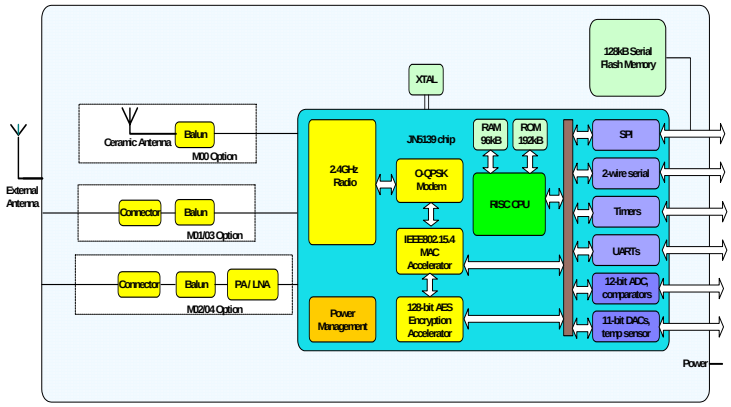
IEEE802.15.4/ZigBee Module Family

Overview

The JN5139-xxx-Myy family is a range of surface mount modules that enable users to implement systems using IEEE802.15.4, 6LoWPAN, JenNet or ZigBee with minimum time to market and at the lowest cost. They remove the need for expensive and lengthy development of custom RF board designs and test suites. The modules use Jennic's JN5139 wireless microcontroller to provide a comprehensive solution with high radio performance and all RF components included. All that is required to develop and manufacture wireless control or sensing products is to connect a power supply and peripherals such as switches, actuators and sensors, considerably simplifying product development.

Three basic hardware module variants are available: JN5139-xxx-M00 with an integrated antenna, JN5139-xxx-M01/M03 with an antenna connector and JN5139-xxx-M02/M04 with a power amplifier and LNA for extended range. Variants are available either with a ZigBee network stack (JN5139-Z01-Myy) or supporting the other stacks (JN5139-001-Myy).

Module Block Diagram



Benefits

- Microminiature module solutions
- Ready to use in products
- Minimises product development time
- No RF test required for systems
- Compliant with FCC part 15 rules, IC Canada RSS 210e, ETSI ETS 300-328 and Japan ARIB STD-T66
- Production volumes supplied pre-programmed with application software

Applications

- Robust and secure low power wireless applications
- Wireless sensor networks, particularly IEEE802.15.4 / ZigBee systems
- Home and commercial building automation
- Home networks
- Toys and gaming peripherals
- Industrial systems
- Telemetry and utilities (e.g. AMR)

Features: Module

- 2.4GHz IEEE802.15.4 & ZigBee compatible
- 2.7-3.6V operation
- Sleep current (with active sleep timer) 2.6µA
- **JN5139-xxx-M00/01/03**
  up to 1km range (ext antenna)
  M00: on board antenna
  M01: SMA connector
  M03: uFl connector
  - Receiver sensitivity –96dBm
  - TX power +2.5dBm
  - TX current 37mA
  - RX current 37mA
  - 18x30mm
- **JN5139-xxx-M02/04**
  up to 4km range
  M02: SMA connector
  M04: uFl connector
  - Receiver sensitivity -100dBm
  - 19dBm TX power
  - TX current 125mA
  - RX current 45mA
  - 18x41mm

Features: Microcontroller

- 16MHz 32-bit RISC CPU
- 96kB RAM, 192kB ROM
- 4-input 12-bit ADC, 2 11-bit DACs, 2 comparators, temperature sensor
- 2 Application timer/counters, 3 system timers
- 2 UARTs (one for in-system debug)
- SPI port with 5 selects
- 2-wire serial interface
- 21 GPIO
- Evaluation kits available with full, unlimited, Software Development Kit

Temperature range
-20°C to +70°C

Lead-free and RoHS compliant

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1. Introduction

The JN5139-xxx-Myy module family provides designers with a ready made component which allows IEEE802.15.4 [1] wireless applications, using Jennic's JenNet networking protocol or ZigBee, to be quickly and easily included in product designs. The modules integrate all of the RF components required, removing the need to perform expensive RF design and test. Products can be designed by simply connecting sensors and switches to the module IO pins. The modules use Jennic's single chip IEEE802.15.4 Wireless Microcontroller, allowing designers to make use of the extensive chip development support material. Hence, this range of modules allows designers to bring wireless applications to market in the minimum time with significantly reduced development effort and cost.

Three module hardware variants are available: JN5139-xxx-M00 (standard module with on board ceramic antenna), JN5139-xxx-M01 (standard module with SMA connector for use with external antennae – recommended for evaluation use) and JN5139-xxx-M02 (high RF power, improved sensitivity module for evaluation of extended range applications). For volume production applications, uFL connector variants are provided (-M03 standard power and –M04 high power). These devices, together with the –M00 variants have FCC modular approvals. Each of these modules can be supplied with a range of protocol stacks, including JenNet for most tree and linear networks, IEEE802.15.4 protocol for point-to-point and star applications and a ZigBee mesh networking stack. The variants available are described below.

1.1. Variants

Variant	Description	FCCID	Industry Canada ID
JN5139-001-M00	IEEE802.15.4 stack, ceramic antenna	TYOJN5139M0	IC: 7438A-CYO5139M0
JN5139-Z01-M00	ZigBee stack, ceramic antenna	TYOJN5139M0	IC: 7438A-CYO5139M0
JN5139-001-M01	IEEE802.15.4 stack, SMA connector - for evaluation	N/A	IC: 7438A-CYO5139M6
JN5139-Z01-M01	ZigBee stack, SMA connector – for evaluation	N/A	IC: 7438A-CYO5139M6
JN5139-001-M02	High Power, IEEE802.15.4 stack, SMA connector – for evaluation	N/A	IC: 7438A-CYO5139M4
JN5139-Z01-M02	High Power, ZigBee stack, SMA connector – for evaluation	N/A	IC: 7438A-CYO5139M4
JN5139-001-M03	IEEE802.15.4 stack, uFl connector	TYOJN5139M3	IC: 7438A-CYO5139M6
JN5139-Z01-M03	ZigBee stack, uFl connector	TYOJN5139M3	IC: 7438A-CYO5139M6
JN5139-001-M04	High Power, IEEE802.15.4 stack, uFl connector	TYOJN5139M4	IC: 7438A-CYO5139M4
JN5139-Z01-M04	High Power, ZigBee stack, uFl connector	TYOJN5139M4	IC: 7438A-CYO5139M4

1.2. Regulatory Approvals

All module types have been tested against the requirements of European standard ETS 300 328 v1.7.1 and a Notified Body statement of opinion for this standard is available on request. The High Power modules with M02 or M04 suffix are approved for use in Europe with reduced output power: +10dBm EIRP is the maximum permitted in Europe. They must not be used with PHY_PIB_ATTR_TX_POWER set above 50 See [3] JN-RM-2002 802.15.4 Stack API.

Additionally, modules with M00, M03 and M04 suffixes have received FCC "Modular Approvals", in compliance with CFR 47 FCC part 15 regulations and in accordance to FCC Public notice DA00-1407. The modules are approved for use with a number of antennas, refer to section A.6.1 for details. See Appendix A.6 for details on the conditions applying to this modular approval. The modular approvals notice and test reports are available on request.

The high power module variant is classified as 'mobile' device pursuant with FCC § 2.1091 and must not be used at a distance of less than 20 cm (8") from any person.

In addition, all modules have Industry Canada RSS 210e Issue 7 (June 2007) certification.

2. Specifications

Most specification parameters for the modules are specified in the chip datasheet - JN-DS- JN5139 Wireless Microcontroller Datasheet, [2]. Where there are differences, the parameters are defined here.

VDD=3.0V @ +25°C

Typical DC Characteristics			Notes
	JN5139-xxx-M00/01/03	**JN5139-xxx-M02/04**	
Deep sleep current	1.3uA	1.3uA	
Sleep current	2.6uA	2.6uA	With active sleep timer
Radio transmit current	37mA	125mA	CPU in doze, radio transmitting
Radio receive current	37mA	45mA	CPU in doze, radio receiving
Centre frequency accuracy	+/-25ppm	+/-25ppm	Additional +/-15ppm allowance for temperature and ageing
Typical RF Characteristics			**Notes**
Receive sensitivity	-96dBm	-102dBm	Nominal for 1% PER, as per 802.15.4 section 6.5.3.3 (Note 1)
Maximum Transmit power	+1dBm	17.5dBm	Nominal (Note 1)
Maximum Transmit power [Boost Mode]	+2.5dBm	N/A	(Note 1)
Transmit power at 3.6V		19dBm	With Vdd=3.6V
Maximum input signal	+10dBm	+10dBm	For 1% PER, measured as sensitivity
RSSI range	-95 to -10 dBm	-105 to -20 dBm	
RF Port impedance – SMA/uFl connector	50 ohm	50 ohm	2.4 - 2.5GHz
VSWR (max)	2:1	2:1	2.4 - 2.5GHz
Peripherals			**Notes**
Master SPI port	5 selects	3 selects	250kHz - 16MHz
Slave SPI port	✓	✓	250kHz - 8MHz
Two UARTs	✓	✓	16550 compatible
Two-wire serial I/F (compatible with SMbus & I^2C)	✓	✓	Up to 400kHz
Two programmable Timer/Counters with capture/compare facility, Tick timer	✓	✓	16MHz clock
Two programmable Sleep Timers	✓	✓	32kHz clock
Digital IO lines (multiplexed with UARTs, timers and SPI selects)	21	19	
Four channel Analogue-to-Digital converter	✓	✓	12-bit, up to 100ks/s
Two channel Digital-to-Analogue converter	✓	✓	11-bit, up to 100ks/s
Two programmable analogue comparators	✓	✓	Ultra low power mode for sleep
Internal temperature sensor and battery monitor	✓	✓	

The performance of all peripherals is defined in the JN-DS- JN5139 Wireless Microcontroller Datasheet [2]
Note 1: Sensitivity is defined for conducted measurements on connectorised modules. Modules with an integrated antenna have approximately 4 dB less e.i.r.p and reciprocal receive sensitivity.

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3. Product Development

Jennic supplies all the development tools and networking stacks needed to enable end product development to occur quickly and efficiently. These are all freely available from **www.nxp.com/jennic**. A range of evaluation/developer kits is also available, allowing products to be quickly breadboarded. Efficient development of software applications is enabled by the provision of a complete, unlimited, software developer kit. Together with the available libraries for the JenNet networking stack, the IEEE802.15.4 MAC and the ZigBee network stack, this package provides everything required to develop application code and to trial it with hardware representative of the final module.

The modules can be user programmed both in development and in production using software supplied by Jennic. They can also be supplied ready loaded with customer defined software if required. Access to the on-chip peripherals, MAC and network stack software is provided through specific APIs. This information is available on the Jennic support website, together with many example applications, user guides, reference manuals and application notes.

3.1. JN5139 Single Chip Wireless Microcontroller

The JN5139-xxx-Myy series is constructed around the JN5139 single chip wireless microcontroller, which includes the radio system, a 32-bit RISC CPU, ROM and RAM memory and a range of analogue and digital peripherals.

The chip is described fully in JN-DS- JN5139 Wireless Microcontroller Datasheet [2].

The module also includes a 1Mbit serial flash memory which holds the application code that is loaded into the JN5139 during the boot sequence.

4. Pin Configurations

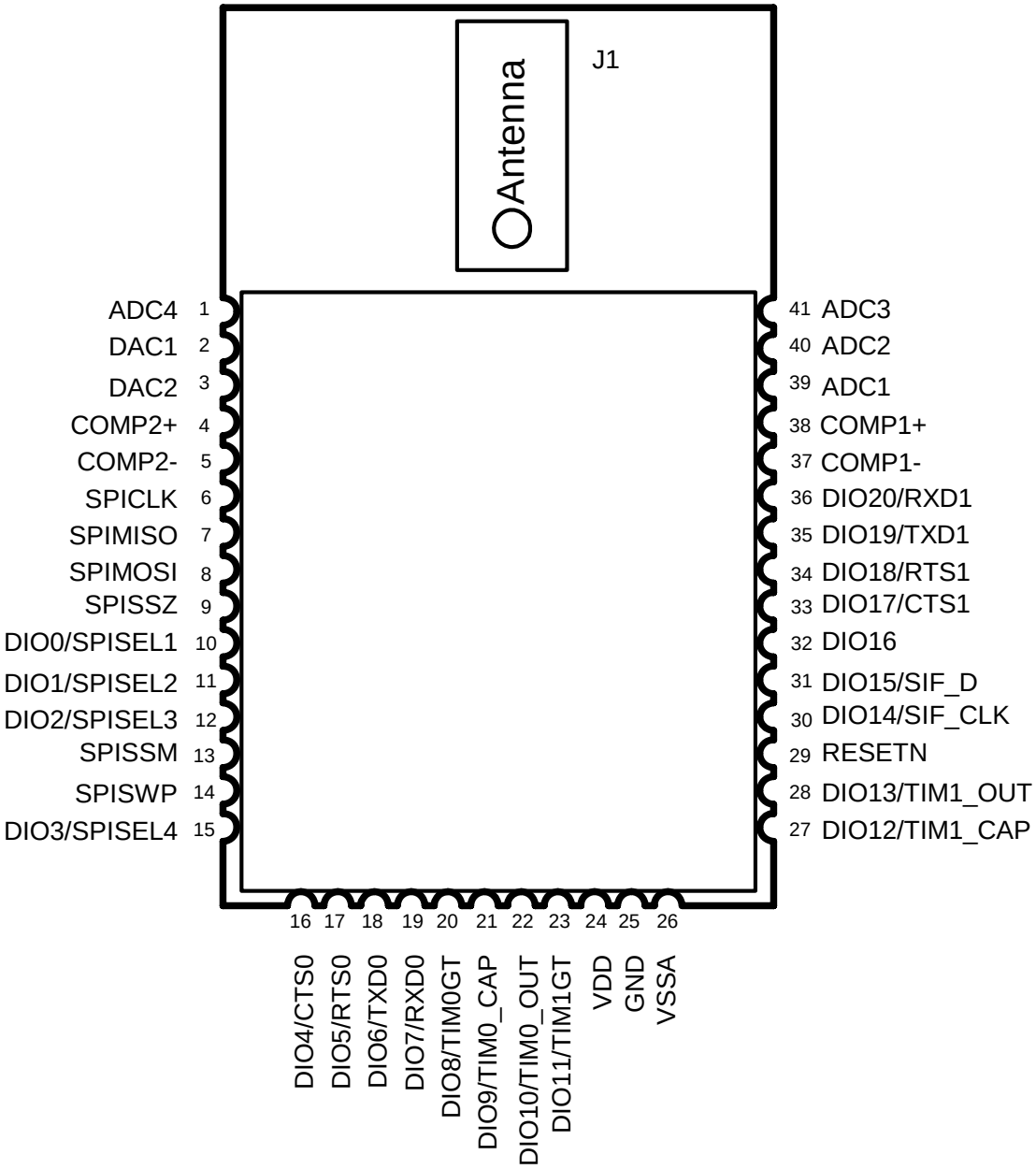


Figure 1: Pin Configuration (top view)

Note that the same basic pin configuration applies for all module designs. However, DIO3/SPISEL4 and DIO2/SPISEL3 are not available on the high power modules.

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4.1. Pin Assignment

Pin	Signal	Function	Alternative Function
1	ADC4	Analogue to Digital input	
2	DAC1	Digital to Analogue output	
3	DAC2	Digital to Analogue output	
4	COMP2+	Comparator 2 inputs	
5	COMP2-		
6	SPICLK	SPI master clock out	
7	SPIMISO	SPI Master In/Slave Out	
8	SPIMOSI	SPI Master Out/Slave In	
9	SPISSZ	SPI select from module - SS0 (output)	
10	SPISEL1	SPI Slave Select1 (output)	General Purpose Digital I/O DIO0
11	SPISEL2	SPI Slave Select2 (output)	General Purpose Digital I/O DIO1
12	SPISEL3*	SPI Slave Select3 (output)	General Purpose Digital I/O DIO2 *
13	SPISSM	SPI select to FLASH (input)	
14	SPISWP	FLASH write protect (input)	
15	SPISEL4*	SPI Slave Select4 (output)	General Purpose Digital I/O DIO3*
16	CTS0	UART0 Clear To Send (input)	General Purpose Digital I/O DIO4
17	RTS0	UART0 Request To Send (output)	General Purpose Digital I/O DIO5
18	TXD0	UART0 Transmit Data (output)	General Purpose Digital I/O DIO6
19	RXD0	UART0 Receive Data (input)	General Purpose Digital I/O DIO7
20	TIM0GT	Timer0 clock/gate (input)	General Purpose Digital I/O DIO8
21	TIM0_CAP	Timer0 capture (input)	General Purpose Digital I/O DIO9
22	TIM0_OUT	Timer0 PWM (output)	General Purpose Digital I/O DIO10
23	TIM1GT	Timer1 clock/gate (input)	General Purpose Digital I/O DIO11
24	VDD	3V power	
25	GND	Digital ground	
26	VSSA	Analogue ground	
27	TIM1_CAP	Timer1 capture (input)	General Purpose Digital I/O DIO12
28	TIM1_OUT	Timer1 PWM (output)	General Purpose Digital I/O DIO13
29	RESETN	Active low reset	
30	SIF_CLK	Serial Interface clock / Intelligent peripheral clock	General Purpose Digital I/O DIO14

Pin	Signal	Function	Alternative Function
31	SIF_D	Serial Interface data / Intelligent peripheral data out (output)	General Purpose Digital I/O DIO15
32	DIO 16	Intelligent peripheral device data in (input)	General Purpose Digital I/O
33	CTS1	UART1 Clear To Send (input) / Intelligent peripheral device select (input)	General Purpose Digital I/O DIO17
34a	RTS1	UART1 Request To Send (output) / Intelligent peripheral interrupt (output)	General Purpose Digital I/O DIO18
35	TXD1	UART1 Transmit Data (output)	General Purpose Digital I/O DIO19
36	RXD1	UART1 Receive Data (input)	General Purpose Digital I/O DIO20
37	COMP1-	Comparator 1 inputs	
38	COMP1+		
39	ADC1	Analogue to Digital input	
40	ADC2	Analogue to Digital input	
41	ADC3	Analogue to Digital input	

*: These two pins are not connected for High power modules

4.2. Pin Descriptions

All pins behave as described in the JN-DS- JN5139 Wireless Microcontroller Datasheet [2], with the exception of the following:

4.2.1 Power Supplies

A single power supply pin, VDD is provided. Separate analogue (VSSA) and digital (GND) grounds are provided. These should be connected together at the module pins.

4.2.2 SPI Memory Connections

SPISWP is a write protect pin for the serial flash memory. This should be held low to inhibit writes to the flash device.

SPISSZ is connected to SPI Slave Select 0 on the JN5139.

SPISSM is connected to the Slave Select pin on the memory.

This configuration allows the flash memory device to be programmed using an external SPI programmer if required. For programming in this mode, the JN5139 should be held in reset by taking RESETN low.

The memory can also be programmed over the UART by using the flash programmer software provided by Jennic. This is available as part of the Software Developer kit and libraries available from **www.nxp.com/jennic**. To enter this programming mode, SPIMISO (pin 7) should be held low whilst the chip is reset. Once programming has finished, the chip should be reset, when it will execute the new code downloaded.

For normal operation of the module and programming over the UART, SPISSZ should be connected to SPISSM.

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5. Electrical Characteristics

In most cases, the Electrical Characteristics are the same for both module and chip. They are described in detail in the chip datasheet. Where there are differences, they are detailed below.

5.1. Maximum Ratings

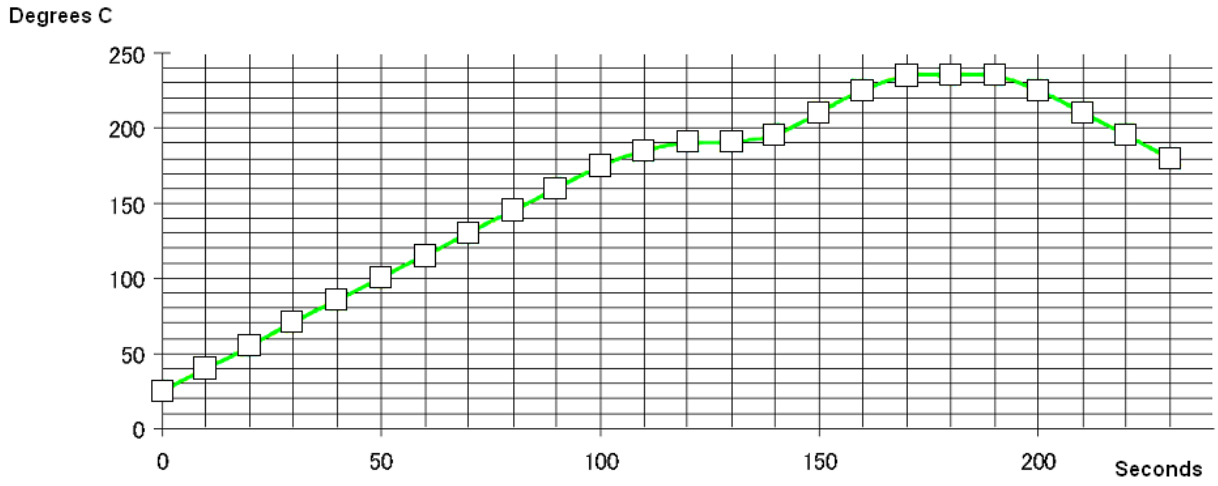
Exceeding these conditions will result in damage to the device.

Parameter	Min	Max
Device supply voltage VDD	-0.3V	3.6V
Voltage on analogue pins: ADC1-4, DAC1-2, COMP1-, COMP1+, COMP2-, COMP2+, DIO9, DIO10, SPISSM, SPISWP, SPICLK, SPIMOSI, SPIMISO,	-0.3V	VDD + 0.3V
Voltage on 5v tolerant digital pins: SPISSZ, DIO0-DIO8, DIO11-DIO20, RESETN	-0.3V	Lower of (VDD + 2V) and 5.5V
Storage temperature	-40ºC	150ºC
Reflow soldering temperature according to IPC/JEDEC J-STD-020C		260ºC

This device is sensitive to ESD and should only be handled using ESD precautions.

5.2. Reflow Profile

For reflow soldering, it is recommended to follow the reflow profile in Figure 2 as a guide, as well as the paste manufacturers guidelines on peak flow temperature, soak times, time above liquidus and ramp rates.



Temperature	25~160 ºC	160~190 ºC	> 220º C	230~Pk.	Pk. Temp (235ºC)
Target Time (s)	90~130	30~60	20~50	10~15	160~270

Figure 2: Recommended solder reflow profile

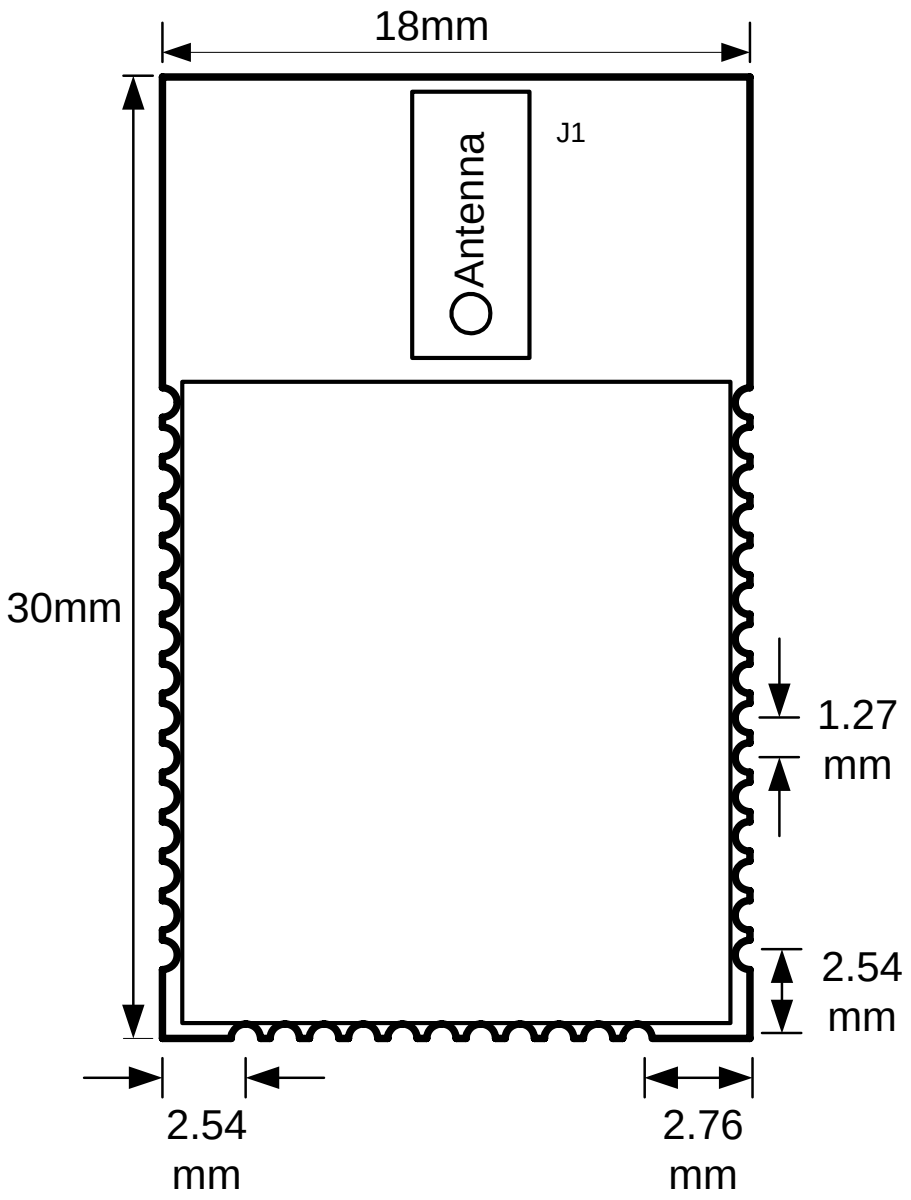
5.3. Operating Conditions

Supply	Min	Max
VDD	2.7V	3.6V
Ambient temperature range	-20°C	70°C

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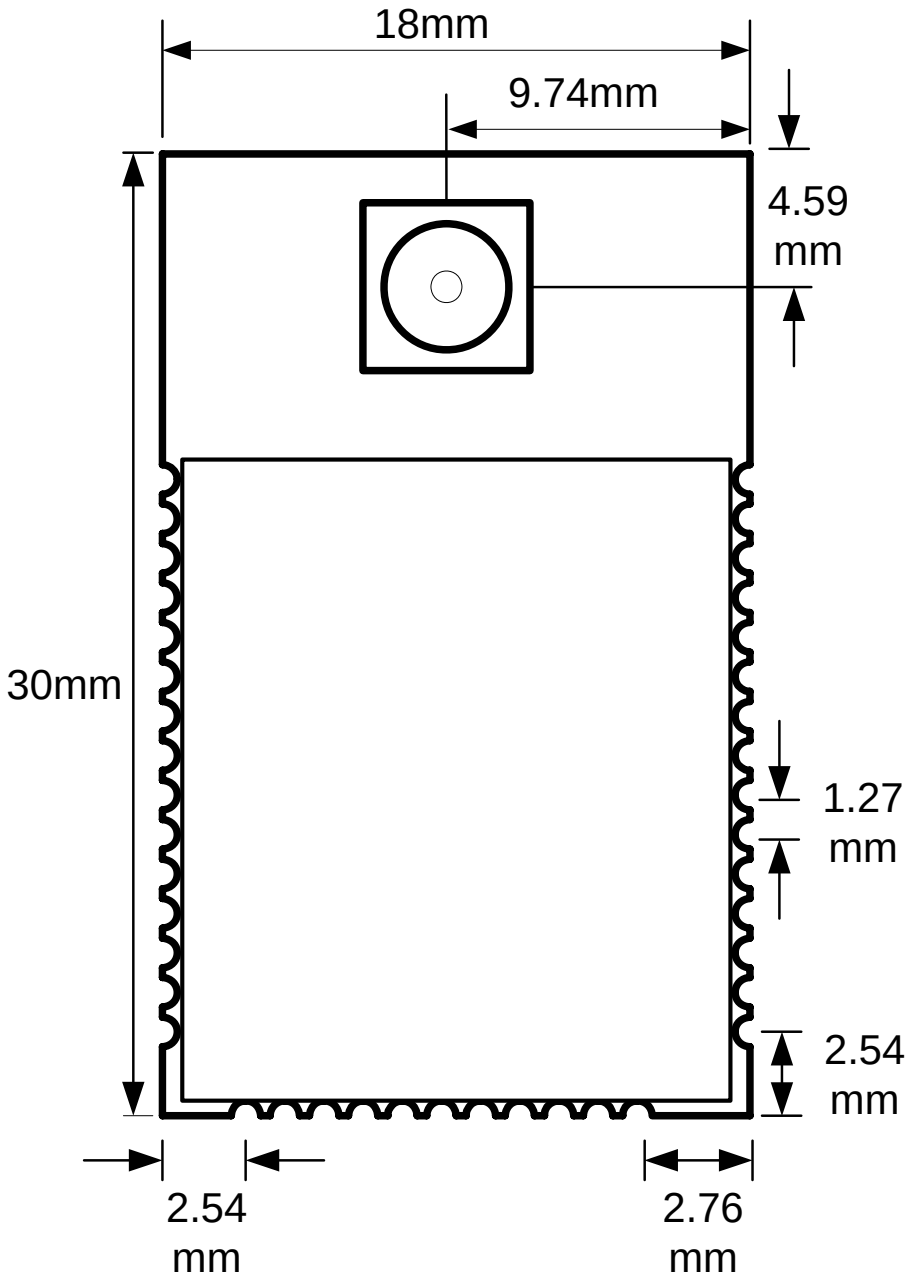
Appendix A Additional Information

A.1 Outline Drawing



Thickness: 3.5mm

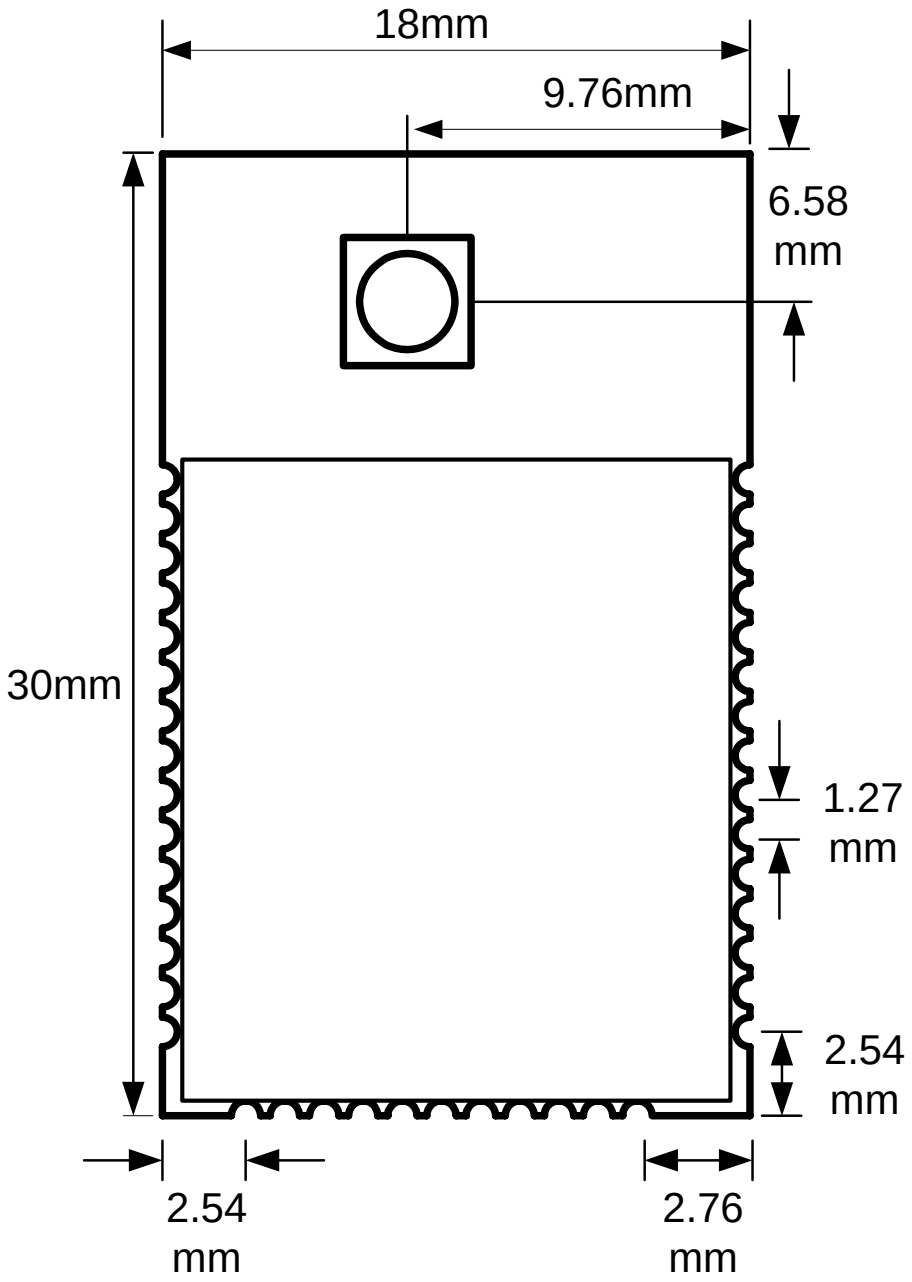
Figure 3 JN5139-xxx-M00 Outline Drawing



Thickness: 3.5mm over can, 10.8mm at SMA connector

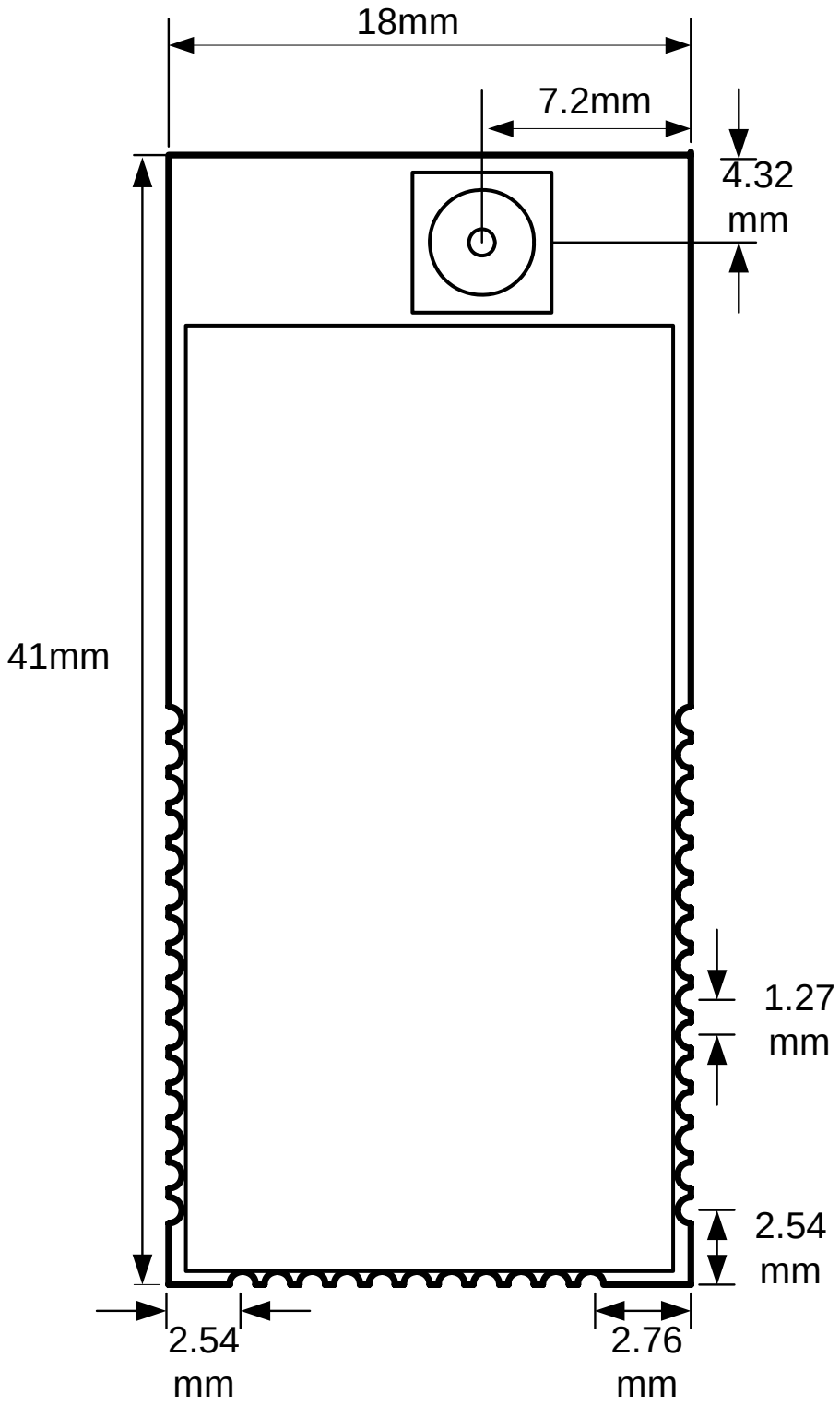
Figure 4 JN5139-xxx-M01 Outline Drawing

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Thickness: 3.5mm

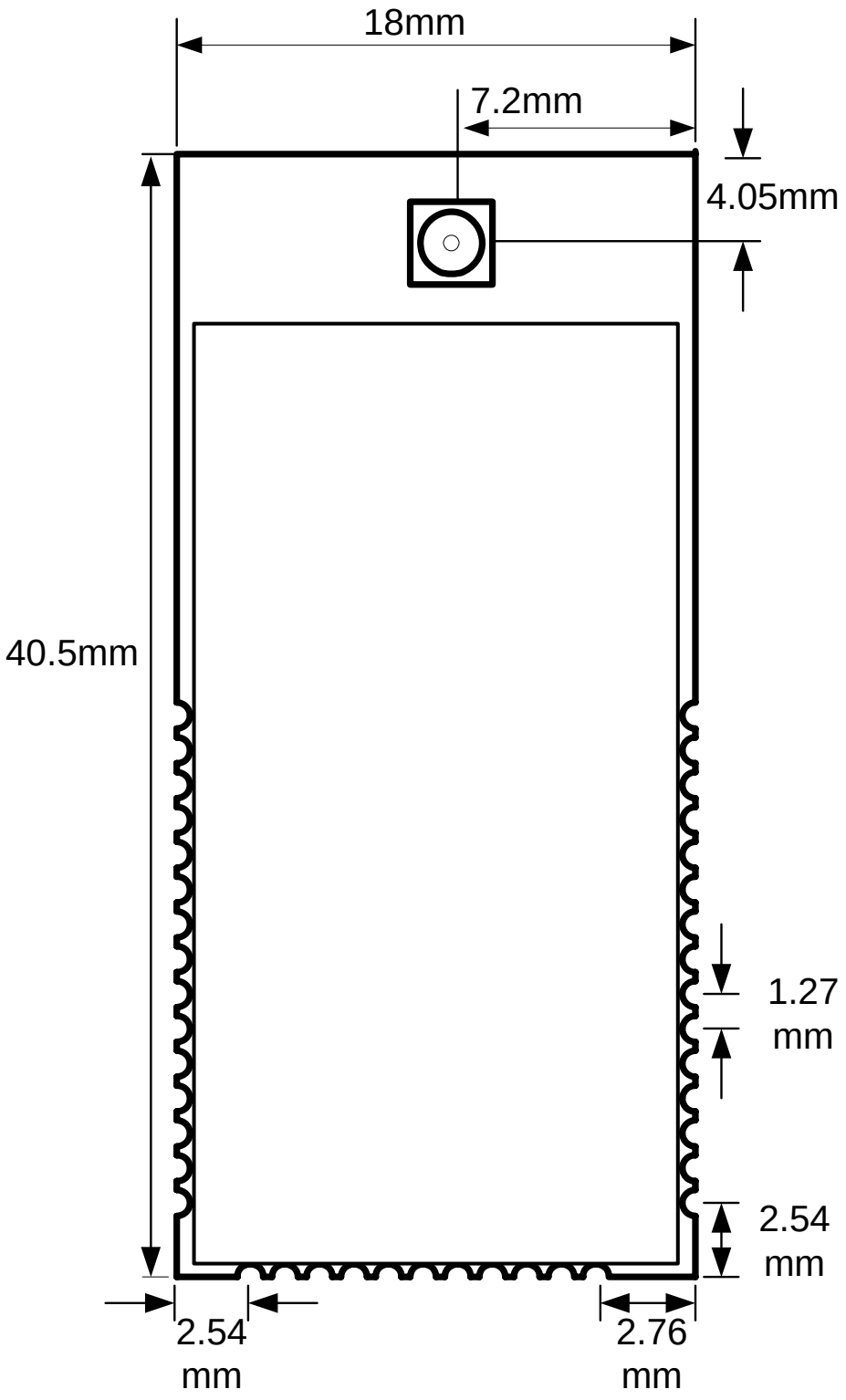
Figure 5 JN5139-xxx-M03 Outline Drawing



Thickness: 3.5mm over can, 10.8mm at SMA connector.

Figure 6 JN5139-xxx-M02 Outline Drawing

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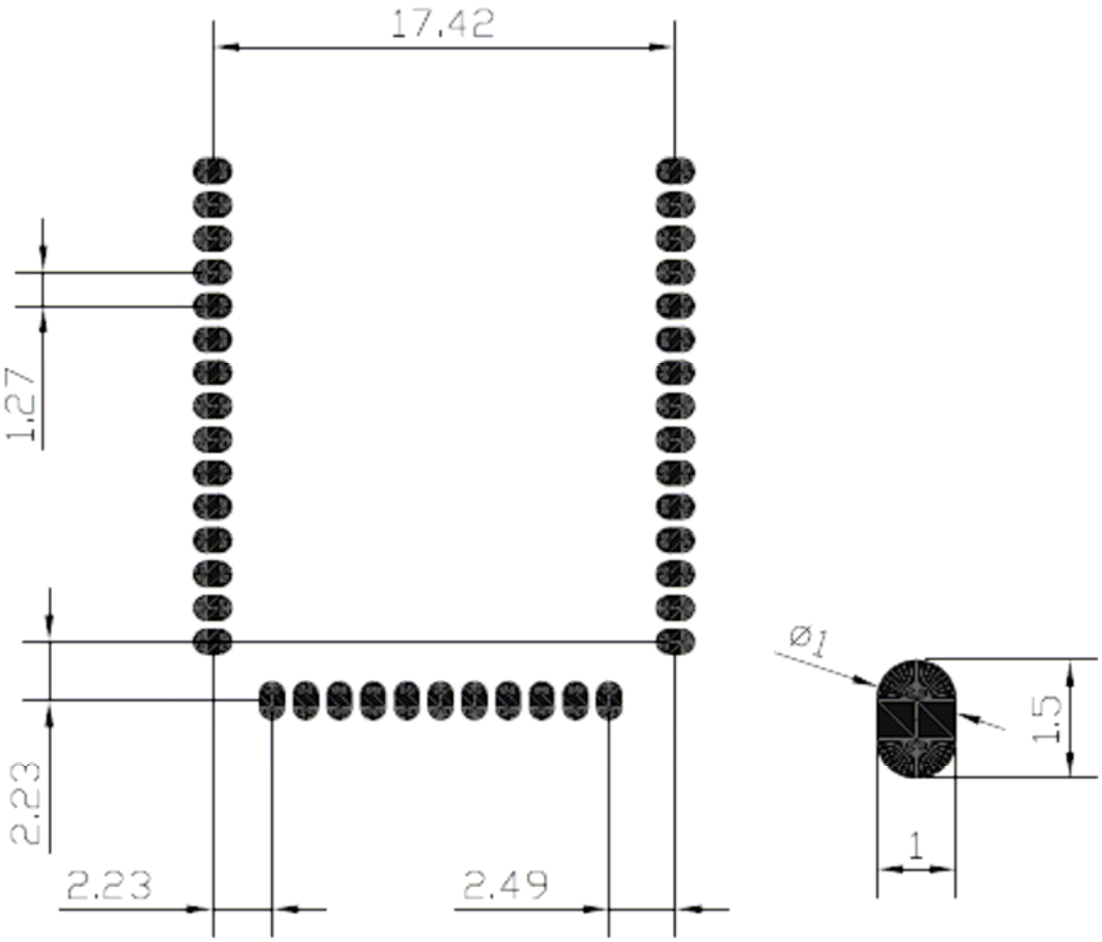


Thickness: 3.5mm

Figure 7 JN5139-xxx-M04 Outline Drawing

A.2 Module PCB Footprint

Dimensions in mm



Note: All modules have the same footprint.

Figure 8 Module PCB footprint

RF note for –M00 modules with ceramic antenna: No components, ground plane or tracks on any layer of the mother board should be placed within 20mm of the 3 free sides of the antenna. Tracks etc may be placed adjacent to the can, but should not extend past the can towards the antenna end of the module for 20mm from the antenna.

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A.3 Ordering Information

Ordering Code Format:

JN5139 - XXX - M / Y1Y2 Y3 Y4

Shipping
T Tape Mounted 500-piece reel (00, 03, 04 modules only)
V Tape Mounted 200-piece reel (01,02 modules only)

Temp Range / Device Status
R1 -20°C to +70°C

Module Type
00 Standard Power, Ceramic antenna
01 Standard Power, SMA connector
02 High Power, SMA connector
03 Standard Power, uFl connector – use for new designs
04 High power, uFl connector– use for new designs

Software Variant
001 IEEE802.15.4 Stack
Z01 ZigBee Stack

Part Number	Ordering Code	Description
JN5139-001-M00R1T	JN5139-001-M/00R1T	JN5139 module, variant as detailed above
JN5139-001-M01R1V	JN5139-001-M/01R1V	
JN5139-001-M02R1V	JN5139-001-M/02R1V	
JN5139-001-M03R1T	JN5139-001-M/03R1T	
JN5139-001-M04R1T	JN5139-001-M/04R1T	
JN5139-Z01-M00R1T	JN5139-Z01-M/00R1T	
JN5139-Z01-M01R1V	JN5139-Z01-M/01R1V	
JN5139-Z01-M02R1V	JN5139-Z01-M/02R1V	
JN5139-Z01-M03R1T	JN5139-Z01-M/03R1T	
JN5139-Z01-M04R1T	JN5139-Z01-M/04R1T	

Label line 1: **IC ID Number**
Label line 2: **FCC ID Number**
Label line 3: **Part Number**
Label line 4: **Barcode Label**
Label line 5: **YYWWTNNNNN (see below)**

Identifier	Description	Format
YY	Year	06 (example)
WW	Week	45 (example)
T	Module type	
NNNNN	Serial Number	

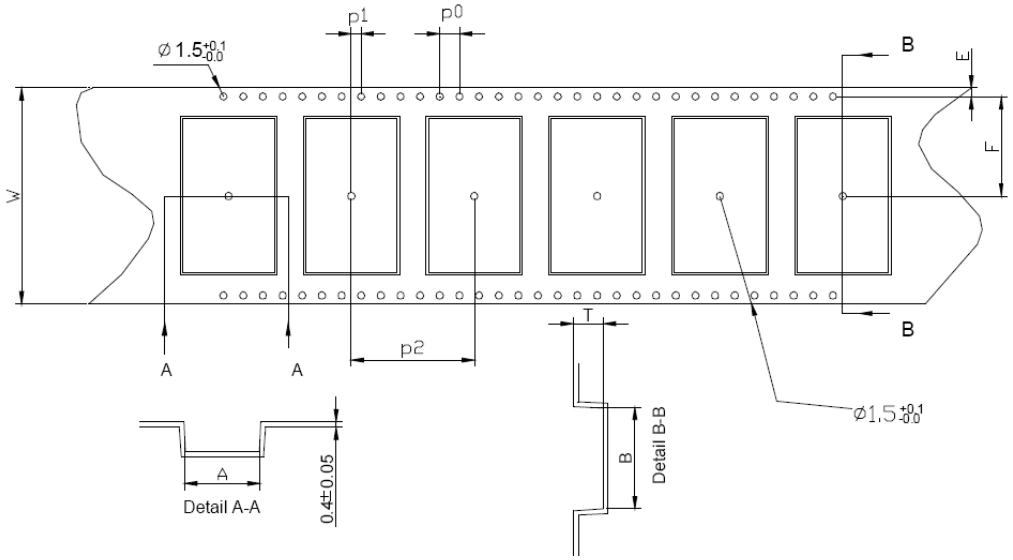


Figure 9: Example module labelling for FCC approved modules

A.4 Tape and Reel Information:

A.4.1 Tape Orientation and dimensions

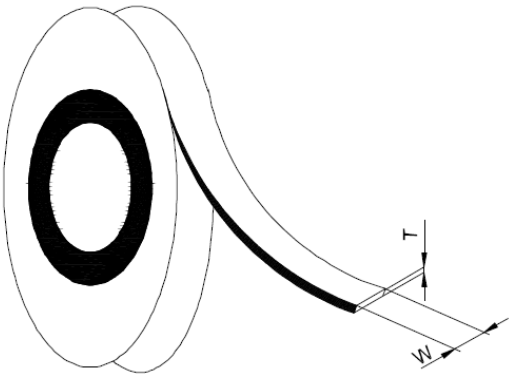
All dimensions are in mm



Module type:	A	B	W	F	E	P0	P1	P2	T	Cover Tape width (W)
JN5139-xxx-M00/03	**18.4**	**30.4**	**44**	**20.2**	**1.75**	**4.0**	**2.0**	**24.0**	**3.4**	**37.5**
JN5139-xxx-M01	**18.4**	**30.4**	**56**	**26.2**	**1.75**	**4.0**	**2.0**	**24.0**	**11.2**	**49.5**
JN5139-xxx-M02	**18.5**	**41.5**	**56**	**26.2**	**1.75**	**4.0**	**2.0**	**24.0**	**11.1**	**49.5**
JN5139-xxx-M04	**18.5**	**40.9**	**56**	**26.2**	**1.75**	**4.0**	**2.0**	**24.0**	**3.4**	**49.5**
Tolerance	**±0.1**	**±0.1**	**±0.3**	**±0.1**	**+0.1**	**±0.1**	**±0.1**	**±0.1**	**±0.1**	**±0.1**

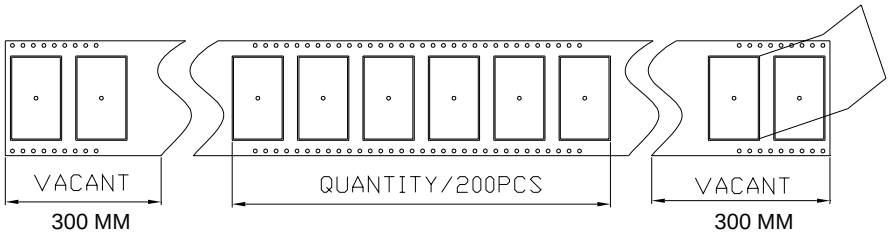
A.4.2 Cover tape details

Thickness (T)	0.061mm
Surface resistivity (component side)	10^4 to 10^7 Ohms/sq
Surface resistivity (component side)	Non-conductive
Backing type:	Polyester
Adhesive type:	PSA
Sealing:	Room ambient

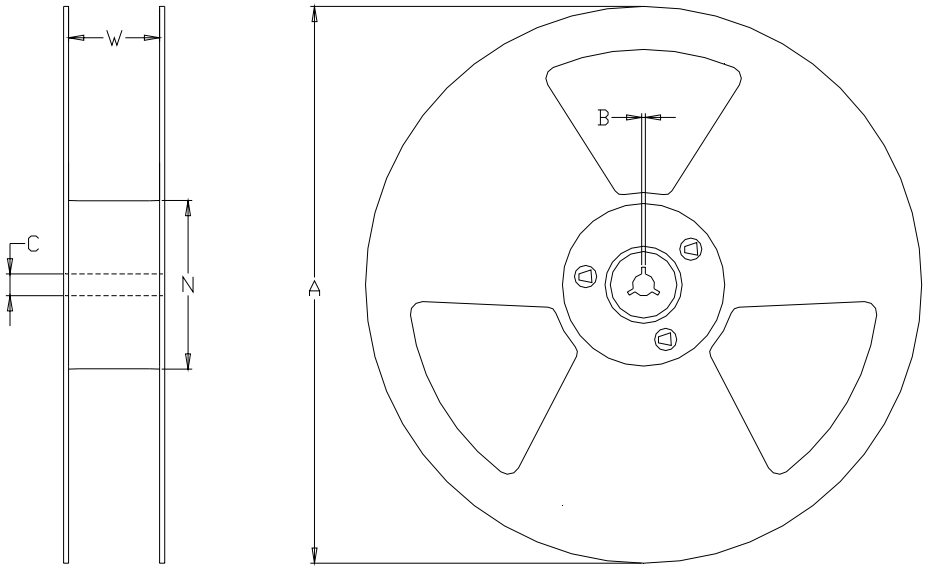


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A.4.3 Leader and Trailer



A.4.4 Reel Dimensions:



Dimensions in mm

Module type:	A	B	C	N	W (min)
JN5139-xxx-M00/03	330 ±1.0	2.2±0.5	13 ±0.2	100 +0.1	44.5 ±0.3
JN5139-xxx-M01/02/04	330 ±1.0	2.2±0.5	13 ±0.2	100 +0.1	56.5 ±0.3

A.5 Related Documents

[1] IEEE Std 802.15.4-2003 IEEE Standard for Information Technology – Part 15.4 Wireless Medium Access Control (MAC) and Physical Layer (PHY) Specifications for Low-Rate Wireless Personal Area Networks (LR-WPANs)

[2] JN-DS- JN5139 Wireless Microcontroller Datasheet

[3] JN-RM-2002 802.15.4 Stack API

A.6 Federal Communication Commission Interference Statement

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 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.

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.

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

WARNING!
FCC Radiation Exposure Statement:

This portable equipment with its antenna complies with FCC's RF radiation exposure limits set forth for an uncontrolled environment. To maintain compliance follow the instructions below;

1. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

2. Avoid direct contact to the antenna, or keep it to a minimum while using this equipment.

This transmitter module is authorized to be used in other devices only by OEM integrators under the following condition:

The transmitter module must not be co-located with any other antenna or transmitter.

As long as the above condition is met, further transmitter testing will not be required. However, the OEM integrator is still responsible for testing their end product for any additional compliance requirements required with this module installed (for example, digital device emissions, PC peripheral requirements, etc.).

A.6.1 Antennas approved by FCC for use with JN5139 modules

	Brand	Model Number	Description	Gain (dBi)	Connector type
1	Aveslink Technology, Inc	E-0360-AT	Patch Antenna - outdoor	18	RP-N [1]
2	Aveslink Technology, Inc	E-0260-AT	Patch Antenna - outdoor	15	RP-N [1]
3	Aveslink Technology, Inc	E-1050-AT	Vertical - outdoor colinear	15	RP-N
4	Aveslink Technology, Inc	E-1040-AT	Vertical - outdoor colinear	12	RP-N
5	Aveslink Technology, Inc	E-0100-AC	Patch Antenna - flying lead	10	RP-SMA
6	Aveslink Technology, Inc	E-1030-AT	Vertical - outdoor colinear	9	RP-N
7	Aveslink Technology, Inc	E-1020-AT	Vertical - outdoor colinear	7	RP-N
8	Aveslink Technology, Inc	E-1710-GC	Vertical - swivel	7	RP-SMA
9	Aveslink Technology, Inc	E-1710-GM	Vertical - swivel	7	RP-TNC
10	Aveslink Technology, Inc	E-1511-GC	Vertical - swivel	5	RP-SMA
11	Aveslink Technology, Inc	E-0030-AA	Patch Antenna - flying lead	4	uFL
12	Aveslink Technology, Inc	E-0030-AC	Patch Antenna - flying lead	4	RP-SMA
13	Aveslink Technology, Inc	E-1204-AC	Ceiling antenna - flying lead	4	RP-SMA
14	Aveslink Technology, Inc	E-1520-CA	Vertical - bulkhead- flying lead	4	uFL
15	Aveslink Technology, Inc	E-1520-GC	Vertical - swivel	4	RP-SMA
16	Aveslink Technology, Inc	E-1450-GC	Vertical-swivel mount	4	RP-SMA
17	Nearson	S152CL-L-PX-2450S	Vertical - knuckle-flying lead	4	uFL
18	Antenna Factor	ANT-2.4-CW-RCL	Vertical - knuckle antenna	2.9	RP-SMA
19	Aveslink Technology, Inc	E-0901-AA	Embedded - flying lead	2.5	uFL
20	Antenna Factor	ANT-2.4-CW-RCT-RP	Vertical - knuckle antenna	2.2	RP-SMA
21	Antennova	2010B6090-01	Vertical - knuckle antenna	2.2	RP-SMA
22	Hyperlink Technology	HG2402RD-RSF	Vertical - knuckle antenna	2.2	RP-SMA
23	Aveslink Technology, Inc	E-0005-AC	Vertical- flying lead	2	RP-SMA
24	Aveslink Technology, Inc	E-2411-GC	Vertical - swivel	2	RP-SMA
25	Aveslink Technology, Inc	E-2410-CA	Vertical - bulkhead- flying lead	2	uFL
26	Aveslink Technology, Inc	E-2410-GC	Vertical - swivel	2	RP-SMA
27	Aveslink Technology, Inc	E-2820-CA	Vertical - bulkhead- flying lead	2	uFL
28	Aveslink Technology, Inc	E-2820-GC	Vertical - swivel	2	RP-SMA
29	Aveslink Technology, Inc	E-0903-AX	Embedded - nickel silver strip	2	None
30	Aveslink Technology, Inc	E-0904-AX	Embedded - nickel silver strip	2	None
31	Embedded Antenna Design	FBKR35068-RS-KR	Vertical - knuckle antenna	2	RP-SMA
32	Nearson	S131CL-L-PX-2450S	Vertical - knuckle-flying lead	2	uFL
33	Laird Technologies	WRR2400-IP04	Vertical - knuckle-flying lead	1.5	uFL
34	Laird Technologies	WRR2400-RPSMA	Vertical - knuckle-flying lead	1.3	RP-SMA
35	Aveslink Technology, Inc	E-6170-DA	Vertical - right angle	1	uFL
36	Laird Technologies	WCR2400-SMRP	Vertical - knuckle antenna	1	RP-SMA

These antennae or versions with alternative connectors may be used to meet European regulations, provided the gain is less than 4.4dBi.

[1] These antennas may not be used with High Power Modules

This device has been designed to operate with the antennas listed above. Antennas not included in this list or having a gain greater than 18 dBi are strictly prohibited for use with this device. The required antenna impedance is 50ohms.

A.6.2 High Power Module usage limitation

The high power module variants are classified as 'mobile' device pursuant with FCC § 2.1091 and **must not** be used at a distance of < 20 cm (8") from any nearby people.

IMPORTANT NOTE: In the event that these conditions can not be met (for certain configurations or co-location with another transmitter), then the FCC authorization is no longer considered valid and the FCC ID can not be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization.

The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user manual of the end product.

The user manual for the end product must include the following information in a prominent location;

"To comply with FCC's RF radiation exposure requirements, the antenna(s) used for this transmitter must not be co-located or operating in conjunction with any other antenna or transmitter."

A.6.3 FCC End Product Labelling

The final 'end product' should be labelled in a visible area with the following:

"Contains TX FCC ID: TYOJN5139M0, TYOJN5139M3 or TYOJN5139M4 " to reflect the version of the module being used inside the product.

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A.7 European R & TTE Directive 1999/5/EC Statement

All modules listed in this datasheet are compliant with ETSI EN 300 328V1.7.1 (2006/05) and are subject to Notified Body Opinion RU1548/9025 Issue 2.

The modules are approved for use with the antennas listed in the following table. The high power modules M02 and M04 are limited to an antenna with a gain of 2.2 dBi or less.

Brand	Model Number	Description	Gain	Connector type
Antenna Factor	ANT-2.4-CW-RCL	Vertical - knuckle antenna	2.9dBi	RP-SMA
Antenna Factor	ANT-2.4-CW-RCT-SS	Vertical - knuckle antenna	2.2dBi	SMA
Laird Technologies	WCR2400-SMA	Vertical - knuckle antenna	1.0dBi	SMA
Laird Technologies	WRR2400-IP04	Vertical - knuckle-flying lead	1.5dBi	uFL
Embedded Antenna Design	BKR2400	Vertical - knuckle antenna	2.0dBi	SMA
Antennova	Titanis	Vertical - knuckle antenna	4.4dBi	SMA
Nearson	S131CL-L-PX-2450S	Vertical - knuckle-flying lead	2.0dBi	uFL
Nearson	S152CL-L-PX-2450S	Vertical - knuckle-flying lead	4.0dBi	uFL
Aveslink Technology, Inc	E-0030-AA	Patch Antenna - flying lead	4dBi	uFL
Aveslink Technology, Inc	E-0030-AB	Patch Antenna - flying lead	4dBi	SMA
Aveslink Technology, Inc	E-1204-AB	Ceiling antenna - flying lead	4dBi	SMA
Aveslink Technology, Inc	E-0005-AB	Vertical- flying lead	2dBi	SMA
Aveslink Technology, Inc	E-1450-GB	Vertical-swivel mount	4dBi	SMA
Aveslink Technology, Inc	E-1450-GC	Vertical-swivel mount	4dBi	RP-SMA
Aveslink Technology, Inc	E-1520-CA	Vertical - bulkhead- flying lead	4dBi	uFL
Aveslink Technology, Inc	E-1520-GB	Vertical - swivel	4dBi	SMA
Aveslink Technology, Inc	E-1520-GC	Vertical - swivel	4dBi	RP-SMA
Aveslink Technology, Inc	E-2411-GB	Vertical - swivel	2dBi	SMA
Aveslink Technology, Inc	E-2410-CA	Vertical - bulkhead- flying lead	2dBi	uFL
Aveslink Technology, Inc	E-2410-GB	Vertical - swivel	2dBi	SMA
Aveslink Technology, Inc	E-2410-GC	Vertical - swivel	2dBi	RP-SMA
Aveslink Technology, Inc	E-2410-HA	Vertical - swivel -flying lead	2dBi	uFL
Aveslink Technology, Inc	E-2820-CA	Vertical - bulkhead- flying lead	2dBi	uFL
Aveslink Technology, Inc	E-2820-GB	Vertical - swivel	2dBi	SMA
Aveslink Technology, Inc	E-2820-GC	Vertical - swivel	2dBi	RP-SMA
Aveslink Technology, Inc	E-6170-DA	Vertical - right angle	1dBi	uFL
Aveslink Technology, Inc	E-0901-AA	Embedded - flying lead	2.5dBi	uFL
Hyperlink Technologies	HG2402RD-RSF	Vertical – tilt and swivel	2.2dBi	RP-SMA

A.8 Industry Canada Statement

To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that permitted for successful communication.

These modules have been designed to operate with antennas having a maximum gain of 4.4 dBi. Antennas having a gain greater than 4.4 dBi are strictly prohibited for use with this device. The required antenna impedance is 50 ohms. The following table shows the approved list of antennas:

Brand	Model Number	Description	Gain
Antenna Factor	ANT-2.4-CW-RCL	Knuckle Antenna	2.9 dBi
Antenna Factor	ANT-2.4-CW-RCT-RP	Knuckle Antenna	2.2 dBi
Centurion	WCR2400-SMRP	Knuckle Antenna	1.0 dBi
Centurion	WRR2400-SMRP	Knuckle Antenna	1.3 dBi
Nearson	S131CL-L-PX-2450S	Knuckle Antenna	2.0 dBi
Nearson	S141AH-2450	Knuckle Antenna	2.0 dBi
Nearson	S152CL-L-PX-2450S	Knuckle Antenna	4.0 dBi
Hyperlink Technologies	HG2402RD-RSF	Knuckle Antenna	2.2 dBi

As long as the above condition is met, further transmitter testing will not be required. However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed (for example, digital device emissions, PC peripheral requirements, etc).

A.8.1 Industry Canada End Product Labelling

For Industry Canada purposes the following should be used.

“Contains Industry Canada ID IC: 7438A-CYO5139M0, IC: 7438A-CYO5139M4 or IC: 7438A-CYO5139M6” to reflect the version of the module being used inside the product.

A.9 RoHS Compliance

JN5139-xxx-Myy devices meet the requirements of Directive 2002/95/EC of the European Parliament and of the Council on the Restriction of Hazardous Substance (RoHS).

The JN5139-xxx-M00, M03 and M04 modules are fully compliant with the Chinese RoHS requirements SJ/T11363-2006.

Further information can be found at **www.nxp.com/jennic**.

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A.10 Status Information

The status of this Data Sheet is **Preliminary**.
Jennic products progress according to the following format:

Advanced

The Data Sheet shows the specification of a product in planning or in development.
The functionality and electrical performance specifications are target values and may be used as a guide to the final specification.
Jennic reserves the right to make changes to the product specification at anytime without notice.

Preliminary

The Data Sheet shows the specification of a product that is in production, but is not yet fully qualified.
The functionality of the product is final. The electrical performance specifications are target values and may used as a guide to the final specification. Modules are identified with an R1 suffix, for example JN5139-Z01-M00R1.
Jennic reserves the right to make changes to the product specification at anytime without notice.

Production

This is the final Data Sheet for the product.
All functional and electrical performance specifications, including minimum and maximum values are final.
This Data Sheet supersedes all previous document versions.
Jennic reserves the right to make changes to the product specification at anytime to improve its performance.

A.11 Disclaimers

The contents of this document are subject to change without notice. Jennic reserves the right to make changes, without notice, in the products, including circuits and/or software, described or contained herein. Information contained in this document regarding device applications and the like is intended through suggestion only and may be superseded by updates. It is your responsibility to ensure that your application meets with your specifications.

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A.12 Version Control

Version	Notes
1.0	1st Issue of Advanced Datasheet
1.1	Update to correct connector positions on drawings and typo on module numbering. –000 modules now read –001.
1.2	Updated to preliminary status, solder reflow profile and antenna lists added. Increased length of –M02 variants
1.3	Updated part numbering and addition of Industry Canada approvals
1.4	Minor specification updates
1.5	Updated antenna information and other minor specification updates
1.6	References to NXP added and ordering information changed

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