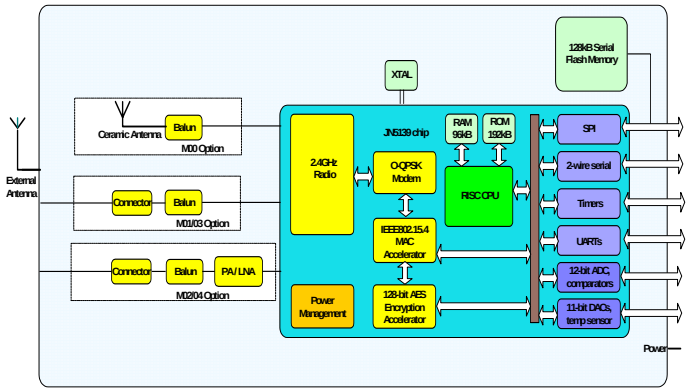
IEEE802.15.4 / ZigBee PIFA Module Family

Overview

This MD100A ZigBee PIFA Module is a range of surface mount modules that enables users to implement IEEE802.15.4 or ZigBee compliant systems 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 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.

Module Block Diagram

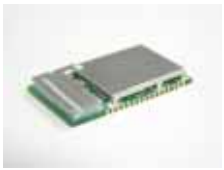


Benefits

- 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

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
- Receiver Sensitivity -96dBm
- Output Power: 4.56dBm
- PIFA Antenna Gain +3dBi
- TX Current 37mA
- RX Current 37mA
- Dimension：18*30*3.5mm
- Weight：2.5g

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

Temperature Range
-40°C to +85°C

Humidity
10 to 95% RH

Lead-Free and RoHS Compliant

Table of Contents

1. Introduction

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1.1 Key Features

1.1.1 Module

- 2.4GHz IEEE802.15.4 & ZigBee Compatible
- 2.7-3.6V Operation
- Sleep Current (with Active Sleep Timer) 2.6μA
- Receiver Sensitivity -96dBm
- TX Power +1.5dBm (without PIFA Antenna)
- PIFA Antenna Gain +3dBi
- TX Current 37mA
- RX Current 37mA
- Dimension：18*30*3.5mm
- Weight：2.5g

1.1.2 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

1.2 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)

2. Specifications

VDD=3.0V @ +25°C

Typical DC Characteristics		Notes
Deep Sleep Current	1.6uA	
Sleep Current	2.6uA	With active sleep timer
Radio Transmit Current	37mA	CPU in doze, radio transmitting
Radio Receive Current	37mA	CPU in doze, radio receiving
Centre Frequency Accuracy	±20ppm	Additional ±20ppm allowance for temperature and ageing
Typical RF Characteristics		**Notes**
Receive Sensitivity	-96dBm	Nominal for 1% PER, as per 802.15.4 section 6.5.3.3 (Note 1)
Maximum Transmit Power (without PIFA Antenna)	+1.5dBm	Nominal (Note 1)
Maximum Transmit Power	+4.5dBm	(Note 1)
Transmit Power		4.56dBm
Maximum Input Signal	0dBm	For 1% PER, measured as sensitivity
RSSI range	-95 to -10dBm	
RF Port Impedance -PIFA Antenna	50 ohm	2.4 - 2.5GHz
VSWR (Max)	2:1	2.4 - 2.5GHz
Peripherals		**Notes**
Master SPI Port	5 selects	250kHz - 16MHz
Slave SPI Port	✓	250kHz - 8MHz
Two UARTs	✓	16550 compatible
TwoWire 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)	✓	
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 PProgrammable Analogue Comparators	✓	Ultra low power mode for sleep
Internal Temperature Sensor and Battery Monitor	✓	

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.

3. Pin Configurations

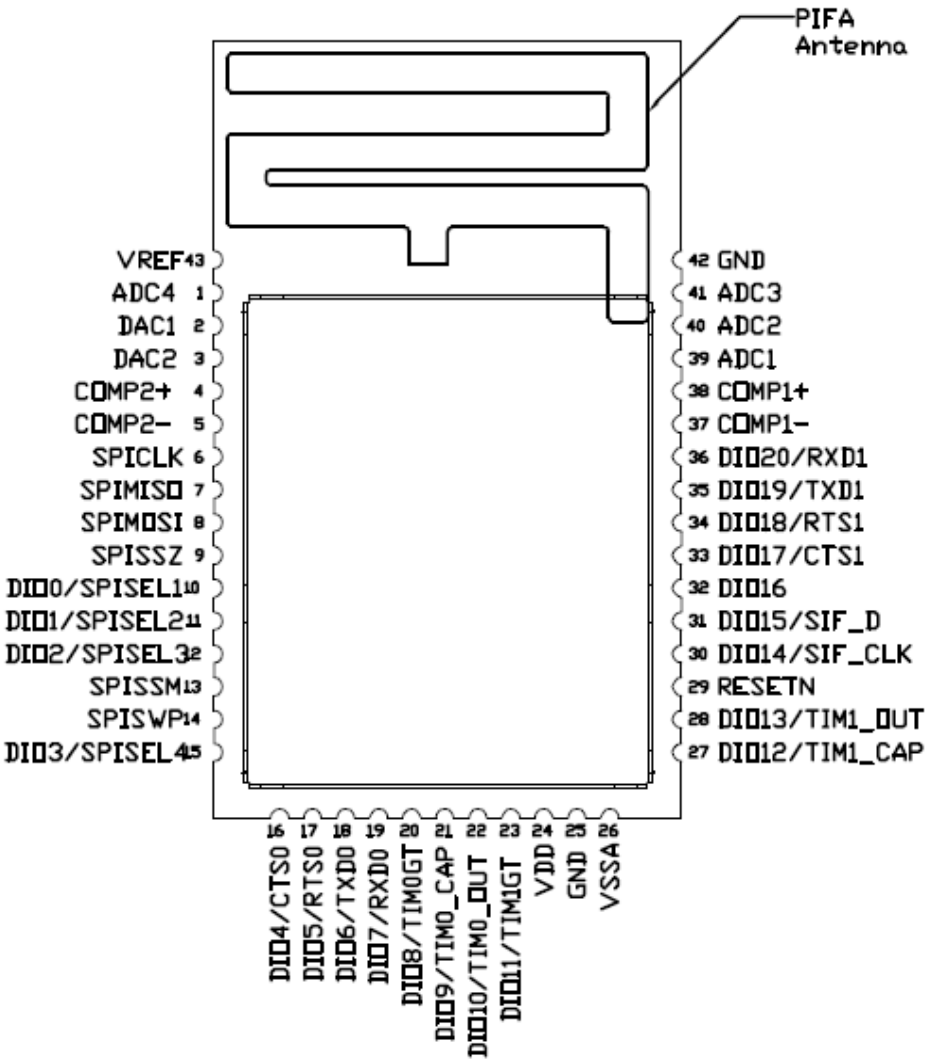


Figure : MD100A Pin Configuration(Top View)

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.

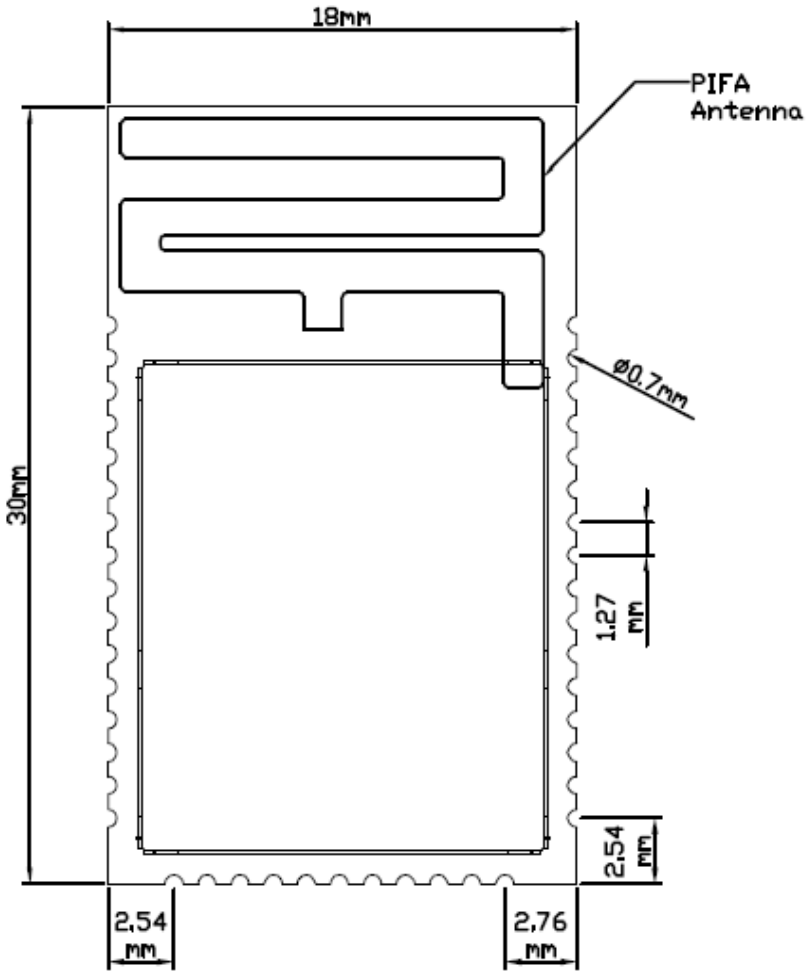
3.1 Pin Assignment

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
31	SIF_D	Serial Interface data / Intelligent peripheral data out	General Purpose Digital I/O DIO15
32	DIO 16	Intelligent peripheral device select	General Purpose Digital I/O

Pin	Signal	Function	Alternative Function
33	CTS1	UART1 Clear To Send (input)	General Purpose Digital I/O DIO17
34	RTS1	UART1 Request To Send (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	
42	GND	Digital ground	
43	VREF	Analogue peripheral reference voltage	

4. Additional Information

4.1 Outline Drawing



Thickness: 3.5mm

Figure : MD100A Outline Drawing

4.2 Module PCB Footprint

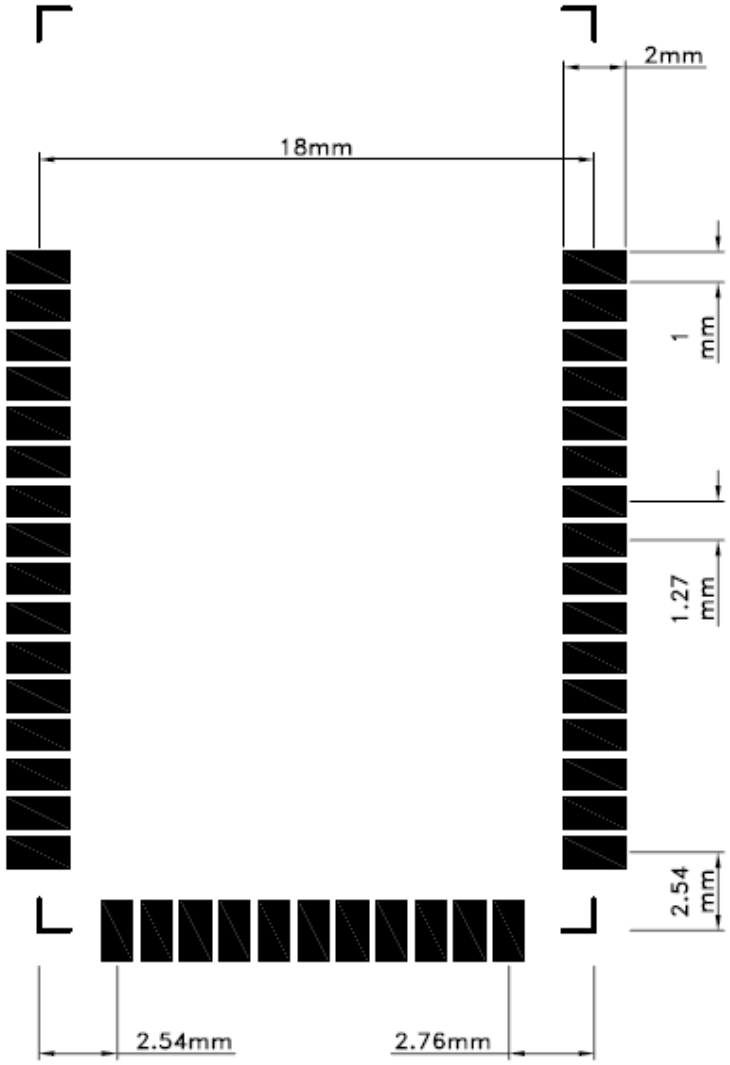
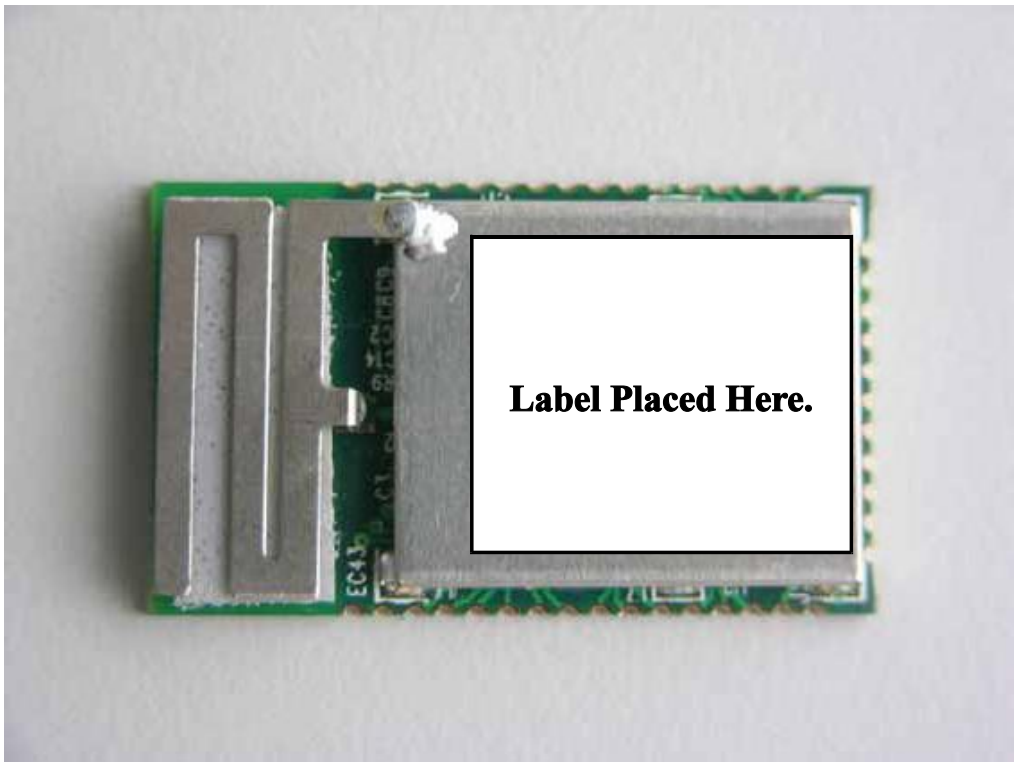


Figure : Module PCB footprint

RF note for MD100A modules with PIFA 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.

4.3 Ordering / Lable Information



Label Line 1：IC ID Number
Label Line 2：FCC ID Number
Label Line 3：Part Name
Label Line 4：Barcode
Label Line 5：Lot Code
YYWWNNNNNN (See Below)

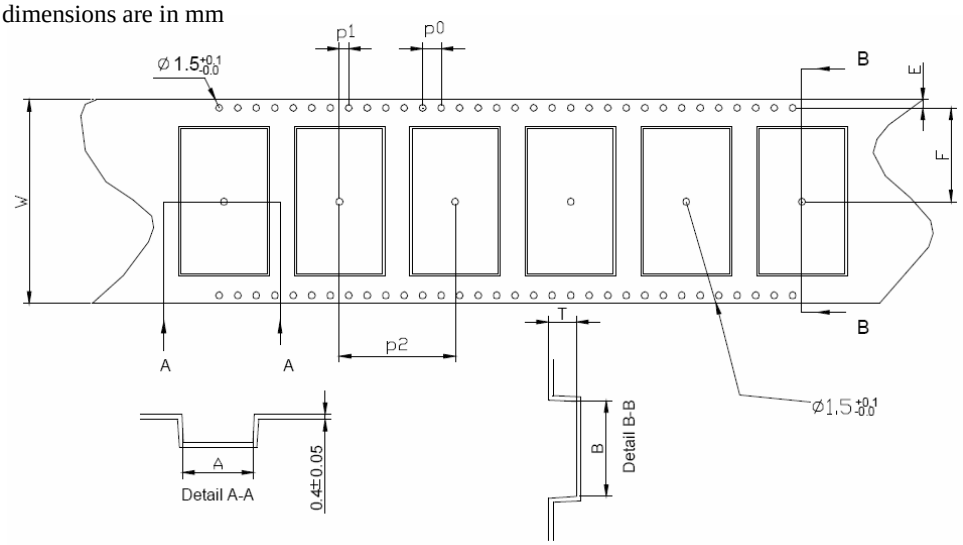
Identifier	Description	Format
YY	Year	09 (Example)
WW	Week	34 (Example)
NNNNNN	Serial Number	000001 (Example)

Figure : Example MD100A Labelling for FCC Approved Modules

4.4 Tape and Reel Information

4.4.1 Tape Orientation and dimensions

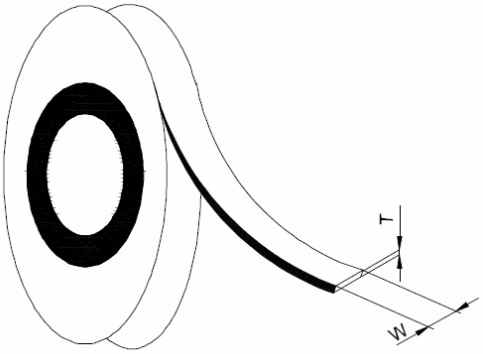
All dimensions are in mm



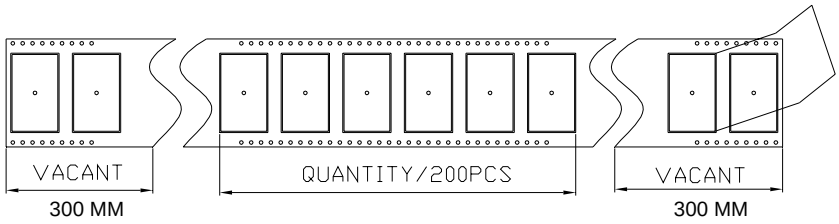
Module type	A	B	W	F	E	P0	P1	P2	T	Cover Tape width (W)
MD100A	18.4	30.4	44	20.2	1.75	4.0	2.0	24.0	4.0	37.5
Tolerance	±0.1	±0.1	±0.3	±0.1	+0.1	±0.1	±0.1	±0.1	±0.1	±0.1

4.4.2 Cover tape details

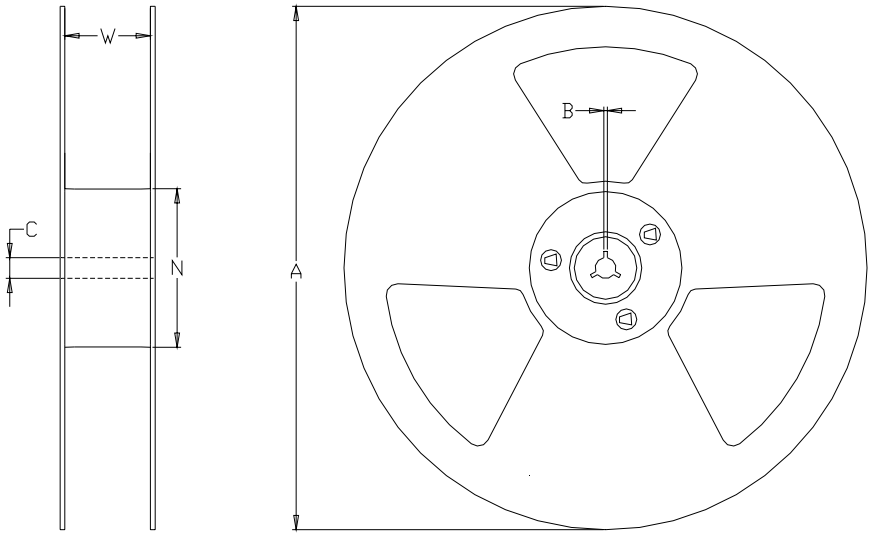
Thickness (T)	0.061mm
Surface resistivity (component side)	10^4 to 10^7 Ohms/sq
Surface resistivity (component side)	Non-conductive
Backing type	Polyester
Adhesive type	PSA
Sealing	Room ambient



4.4.3 Leader and Trailer



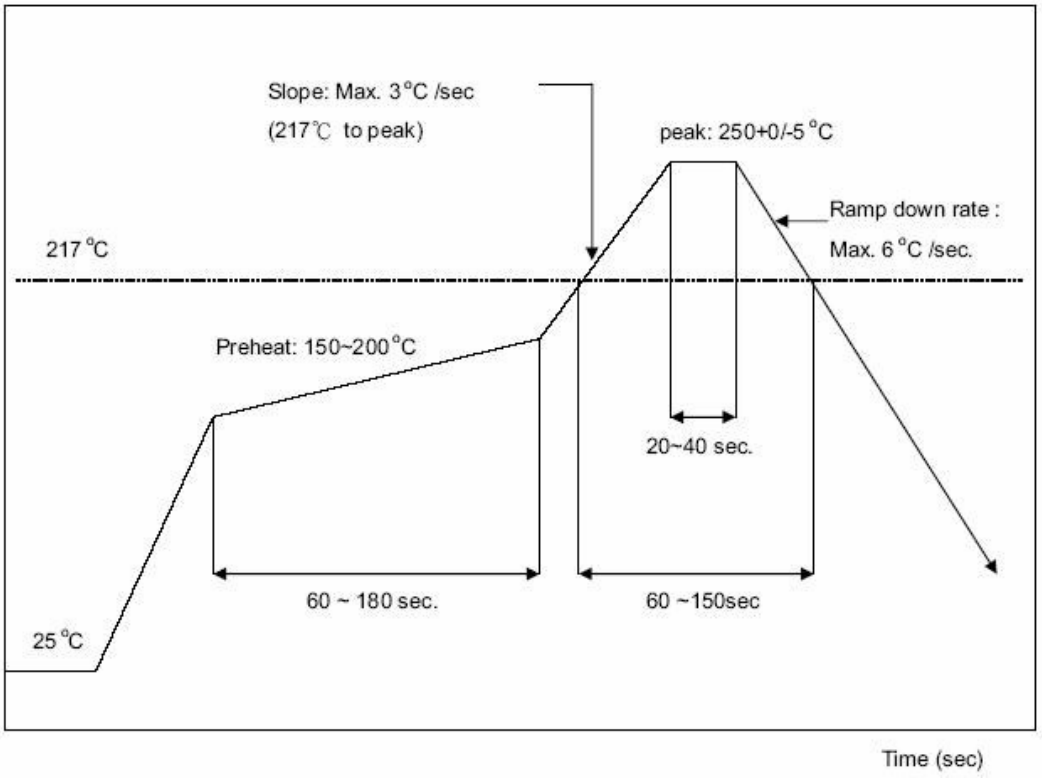
4.4.4 Reel Dimensions



Module type:	A	B	C	N	W (min)
MD100A	330 ±1.0	2.2±0.5	13 ±0.2	100 +0.1	44.5 ±0.3

4.5 SMT IR Profile

Average ramp-up rate (217C to peak): 3 ℃ /sec. max.
Preheat：150~200 ℃、60~180 seconds
Temperature maintained above 217 oC : 60~150 seconds
Time within 5 ℃ of actual peak temperature: 20 ~ 40 sec.
Peak temperature：250+0/-5 ℃
Ramp-down rate : 6 ℃/sec. max.
Time 25 ℃ to peak temperature : 8 minutes max.
Cycle interval：5 minus



4.6 How to Avoid ESD Damage to ICs

* Any person handling the ICs should be grounded either with a wrist strap or ESD-protective footwear used in conjunction with a conductive or static-dissipative floor or floor mat.
* The work surface where devices are placed for handling, processing, testing, etc.,must, be made of static-dissipative material and be grounded to ESD ground.
* All insulator materials must either be removed from the work area or must be neutralized with an ionizer. Static-generating clothing must be covered with an ESD-protective smock.
* When ICs are being stored, transferred between operations or workstations, or shipped, they must be kept in a Faraday shield container with inside surfaces (surfaces touching the ICs) that are static-dissipative.

4. Contact Information

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You are cautioned that changes or modifications not expressly approved by the party responsible for compliance could void your authority to operate the equipment.

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

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

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 which is provided by OEM integrators for end users must include the following information in a prominent location. "To comply with FCC RF exposure compliance requirements, the antenna used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter. Label for end product must include " Contains FCC ID: XNNMD100A" or " A RF transmitter inside, FCC ID: XNNMD100A".