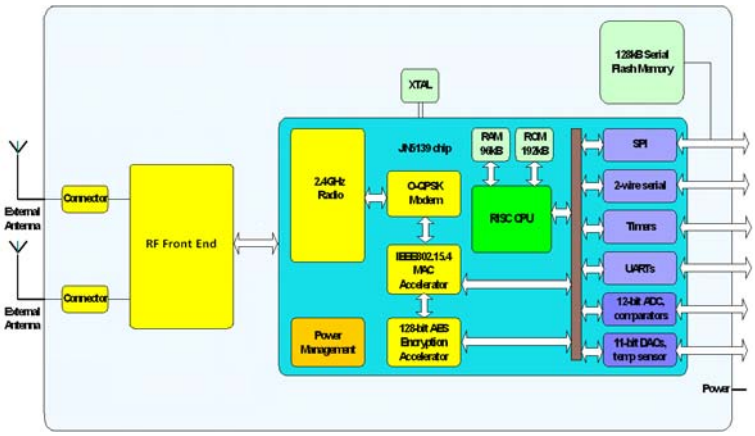
Aveslink MD-223FA Preliminary Data Sheet

IEEE802.15.4 / ZigBee uFL Diversity High Power Module Family

Overview

This MD-223FA ZigBee Module is a surface mount module with 200mW output power that enables users to implement IEEE802.15.4 or ZigBee compliant systems with minimum time to market and at the lowest cost. This module is designed with the antenna switch diversity function to overcome the multi-path fading issue. Thus will improve the communication ranges. It also provides two uFL connectors with the ability to connect to the external antenna. It enables the system to extend the communication range. 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
- Minimizes product development time
- No RF test required for systems
- Compliant with FCC part 15 rules, IC Canada
- Long coverage with build-in power amplifier chip
- Antenna diversity to achieve longer range

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 for SOC
- 3.0-3.6V for Power Amplifier
- Antenna Diversity
- Sleep Current (with Active Sleep Timer) 2.6µA
- Receiver Sensitivity -100dBm
- TX Power +23dBm
- TX Current 450mA
- RX Current 45mA
- Dimension：40.5*18*3.5mm
- Weight：3.0g

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 3
   1.1 Key Features 3
      1.1.1 Module 3
      1.1.2 Microcontroller 3
   1.2 Applications 3
   1.3 Module Block Diagram 4
2. Specifications 5
3. Pin Configurations 6
   3.1 Pin Assignment 7
4. Additional Information 9
   4.1 Outline Drawing 9
   4.2 Module PCB Footprint 10
   4.3 Ordering / Lable Information 11
   4.4 Tape and Reel Information 12
      4.4.1 Tape Orientation and dimensions 12
      4.4.2 Cover tape details 12
      4.4.3 Leader and Trailer 13
      4.4.4 Reel Dimensions 13
   4.5 SMT IR Profile 14
   4.6 How to Avoid ESD Damage to ICs.....14
5. Contact Information 15

1. Introduction

This MD-223FA ZigBee Module is a surface mount module with 200mW output power that enables users to implement IEEE802.15.4 or ZigBee compliant systems with minimum time to market and at the lowest cost. This module is designed with the antenna switch diversity function to overcome the multi-path fading issue. Thus will improve the communication ranges. It also provides two uFL connectors with the ability to connect to the external antenna. It enables the system to extend the communication range. 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.

1.1 Key Features

1.1.1 Module

- 2.4GHz IEEE802.15.4 & ZigBee Compatible
- 2.7-3.6V for SOC
- 3.0-3.6V for Power Amplifier
- Antenna Diversity
- Sleep Current (with Active Sleep Timer) 2.6μA
- Receiver Sensitivity -100dBm
- TX Power +23dBm
- TX Current 450mA
- RX Current 45mA
- Dimension：40.5*18*3.5mm
- Weight：3.0g

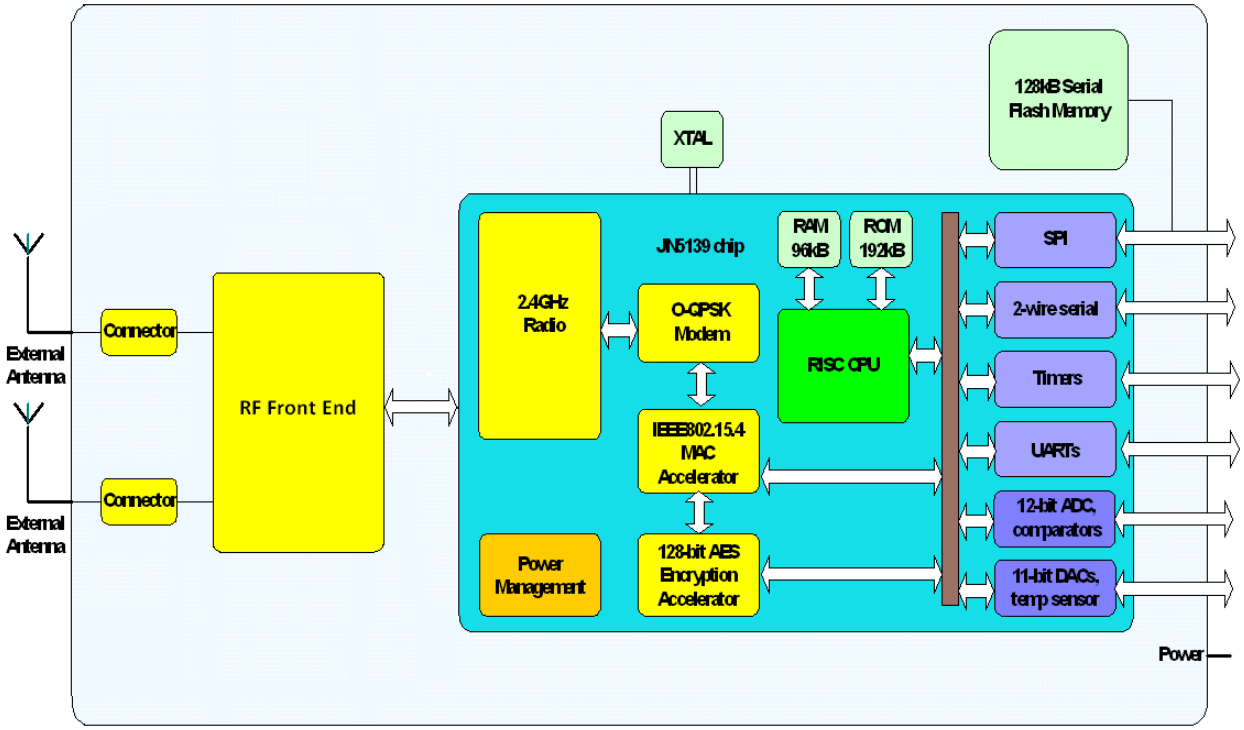
1.1.2 Microcontroller

- 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)

1.3 Module Block Diagram



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	-100dBm	Nominal for 1% PER, as per 802.15.4 section 6.5.3.3
Maximum Transmit Power (without PIFA Antenna)	+23dBm	With VPA=3.3V
Total Transmit Current	450mA	
Total Receive Current	45mA	
Maximum Input Signal	0dBm	For 1% PER, measured as sensitivity
RSSI Range	TBD	
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
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)	✓	
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	✓	

3. Pin Configurations

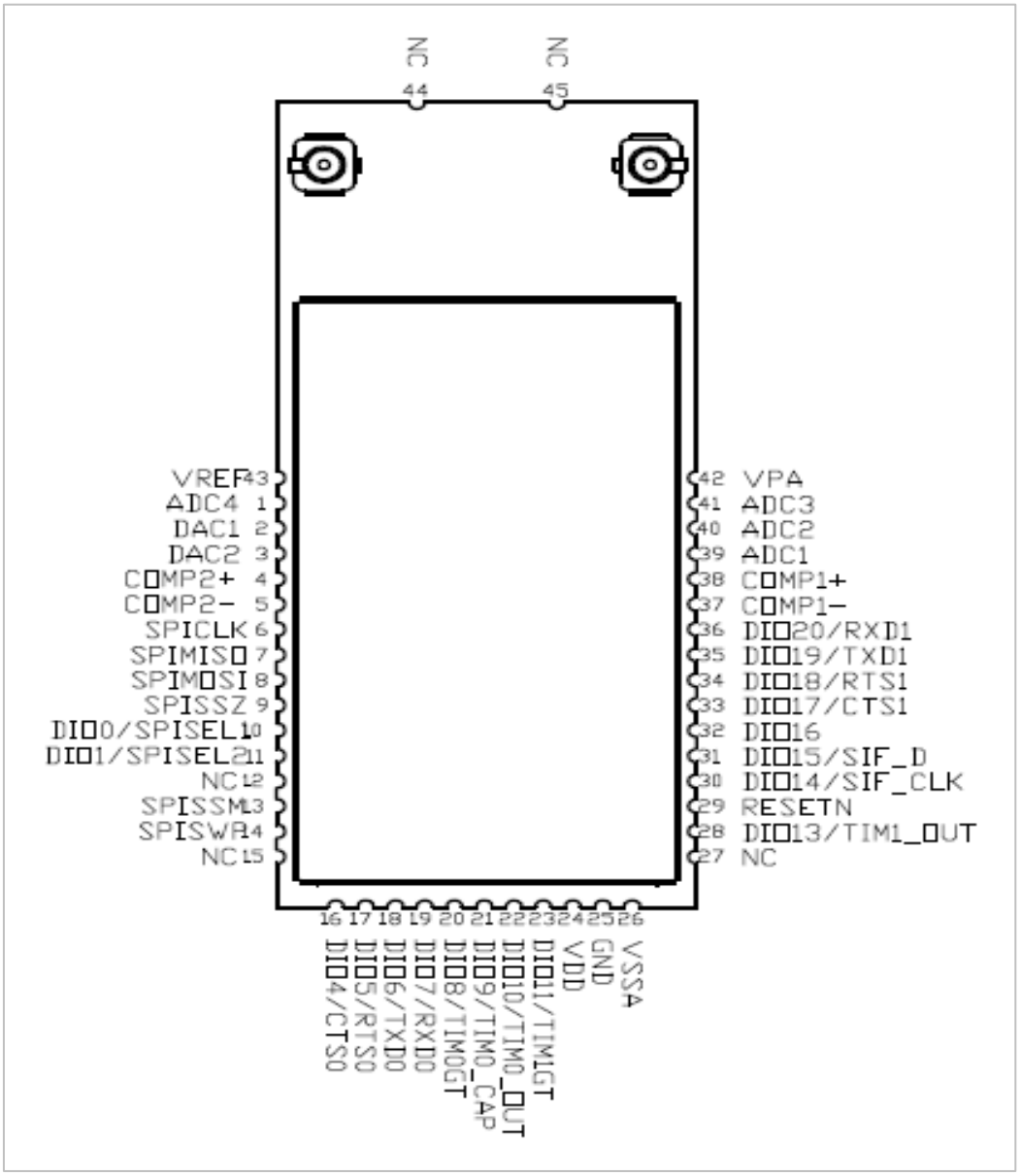


Figure: MD-223FA Pin Configuration(Top View)

Note: NC Pin such as Pin-27 (DIO12/TIM1_CAP), Pin-12 (DIO3/SPISEL4), Pin-15 (DIO2/SPISEL3) and are not available on the diversity high power modules.

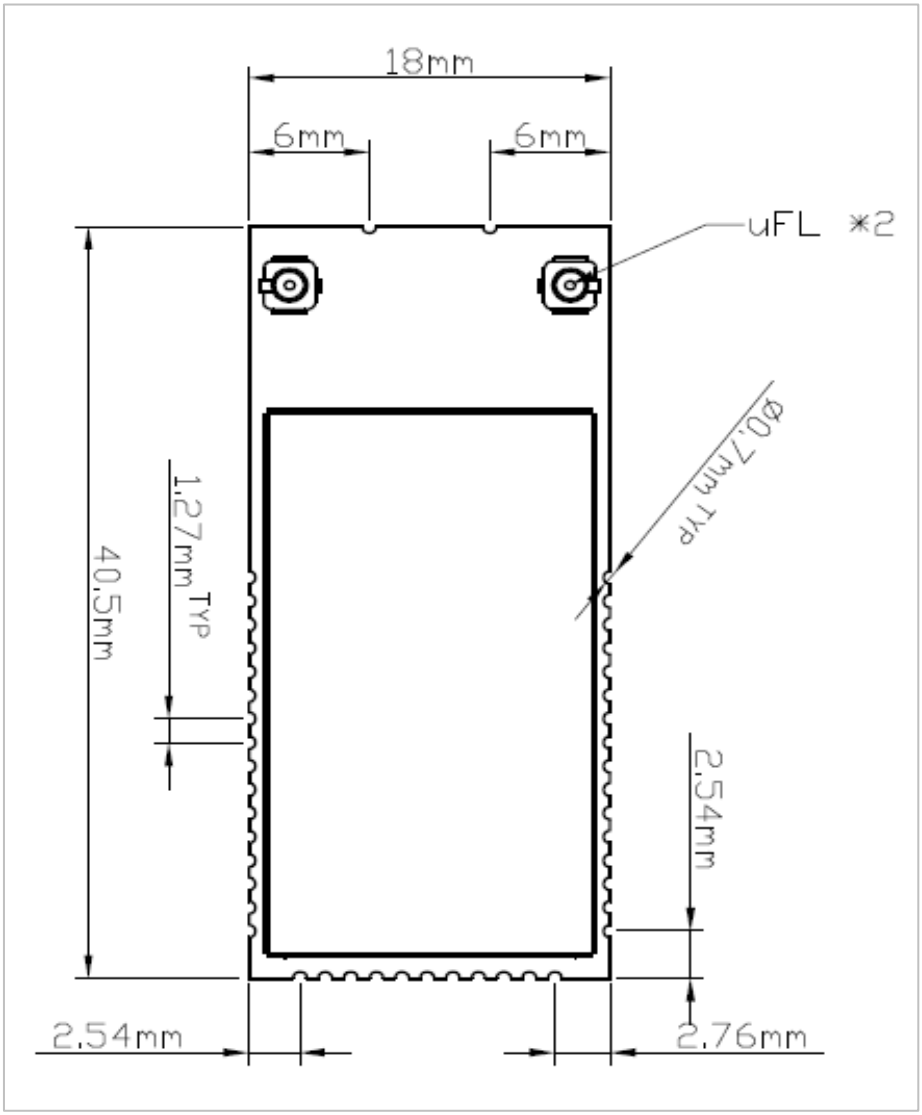
3.1 Pin Assignment

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	NC		
13	SPISSM	SPI select to FLASH (input)	
14	SPISWP	FLASH write protect (input)	
15	NC		
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	NC		
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	General Purpose Digital I/O DIO14

Pin	Signal	Function	Alternative Function
31	SIF_D	Serial Interface data / Intelligent peripheral data	General Purpose Digital I/O DIO15
32	DIO 16	Intelligent peripheral device select	General Purpose Digital I/O
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	VPA	RF Front End 3.3V power	
43	VREF	Analogue peripheral reference voltage	
44	NC		
45	NC		

4. Additional Information

4.1 Outline Drawing



Thickness: 3.5mm

Figure : MD-223FA Outline Drawing

4.2 Module PCB Footprint

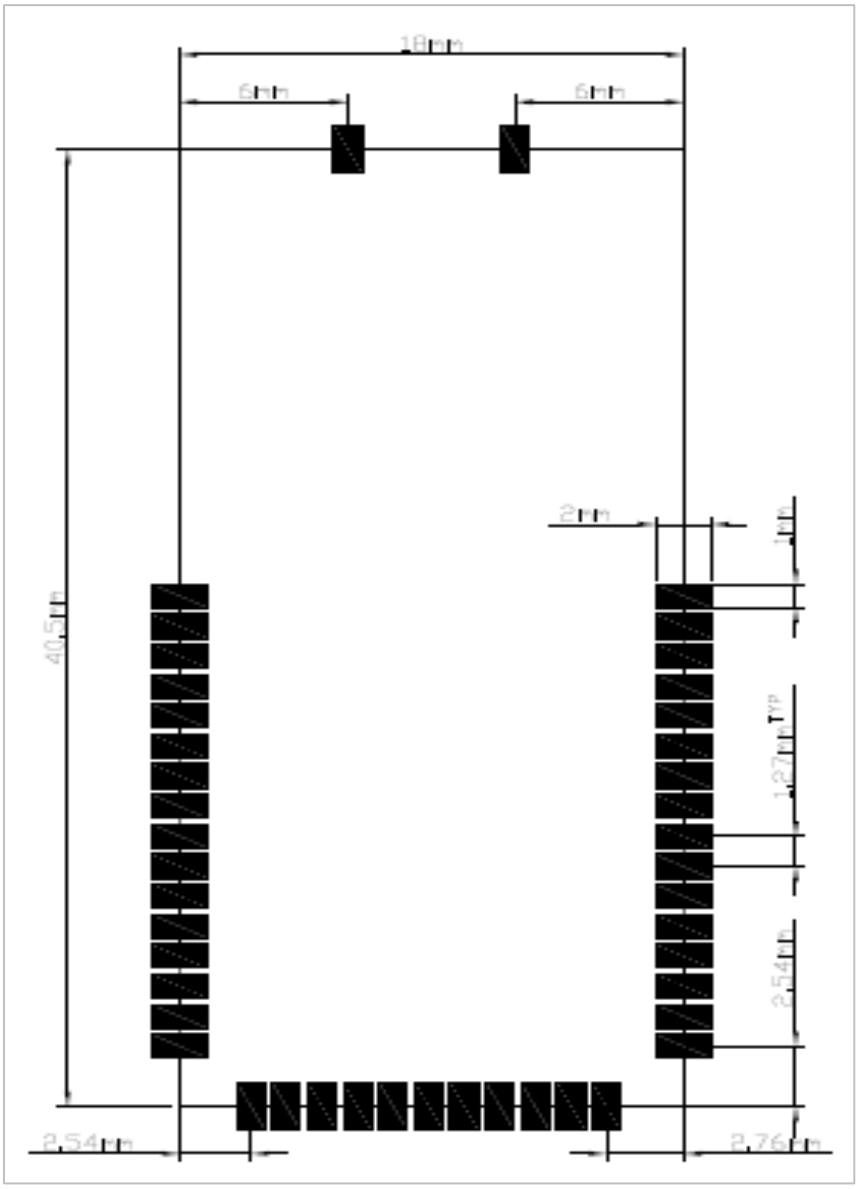


Figure: Module PCB footprint

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)

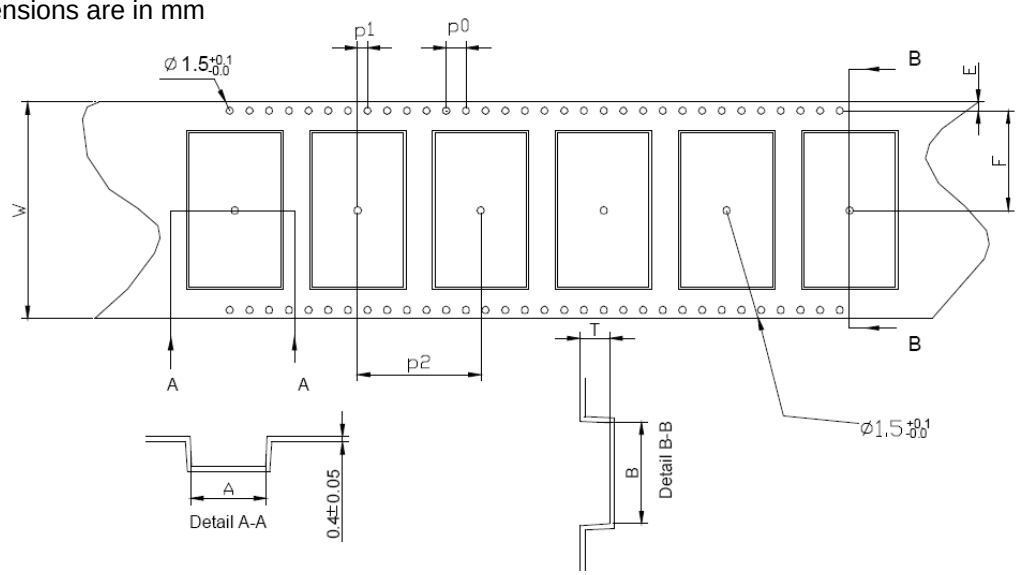
Identifier	Description	Format
YY	Year	09 (Example)
WW	Week	34 (Example)
NNNNNN	Serial Number	000001 (Example)

Figure: Example MD-223FA Labeling for FCC Approved Modules

4.4 Tape and Reel Information

4.4.1 Tape Orientation and dimensions

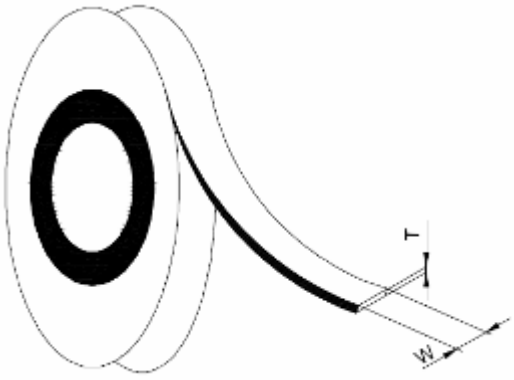
All dimensions are in mm



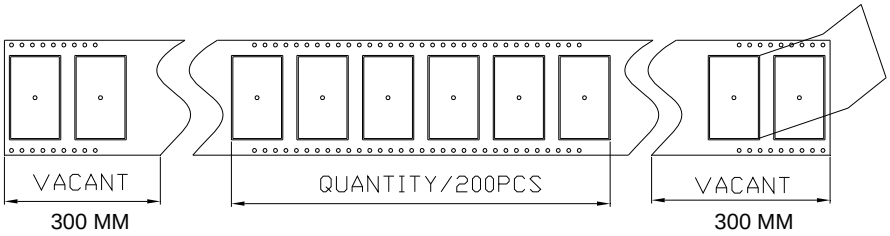
Module type	A	B	W	F	E	P0	P1	P2	T	Cover Tape width (W)
MD-223FA	18.5	40.9	56	26.2	1.75	4.0	2.0	24.0	3.4	49.5
Tolerance	±0.1	±0.1	±0.3	±0.1	+0.1	±0.1	±0.1	±0.1	±0.1	±0.1

4.4.2 Cover tape details

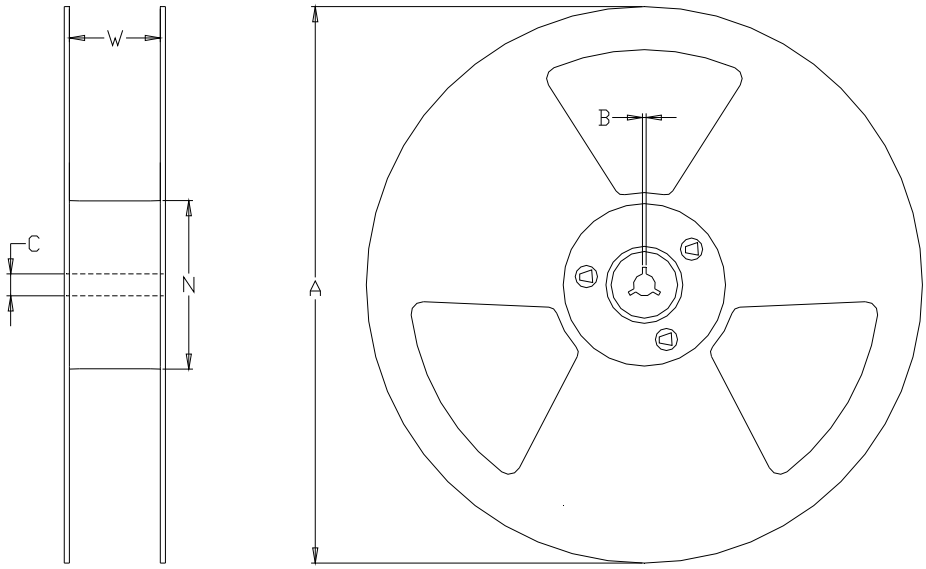
Thickness (T)	0.061mm
Surface resistivity (component side)	10^4 to 10^7 Ohms/sq
Surface resistivity (component side)	Non-conductive
Backing type	Polyester
Adhesive type	PSA
Sealing	Room ambient



4.4.3 Leader and Trailer



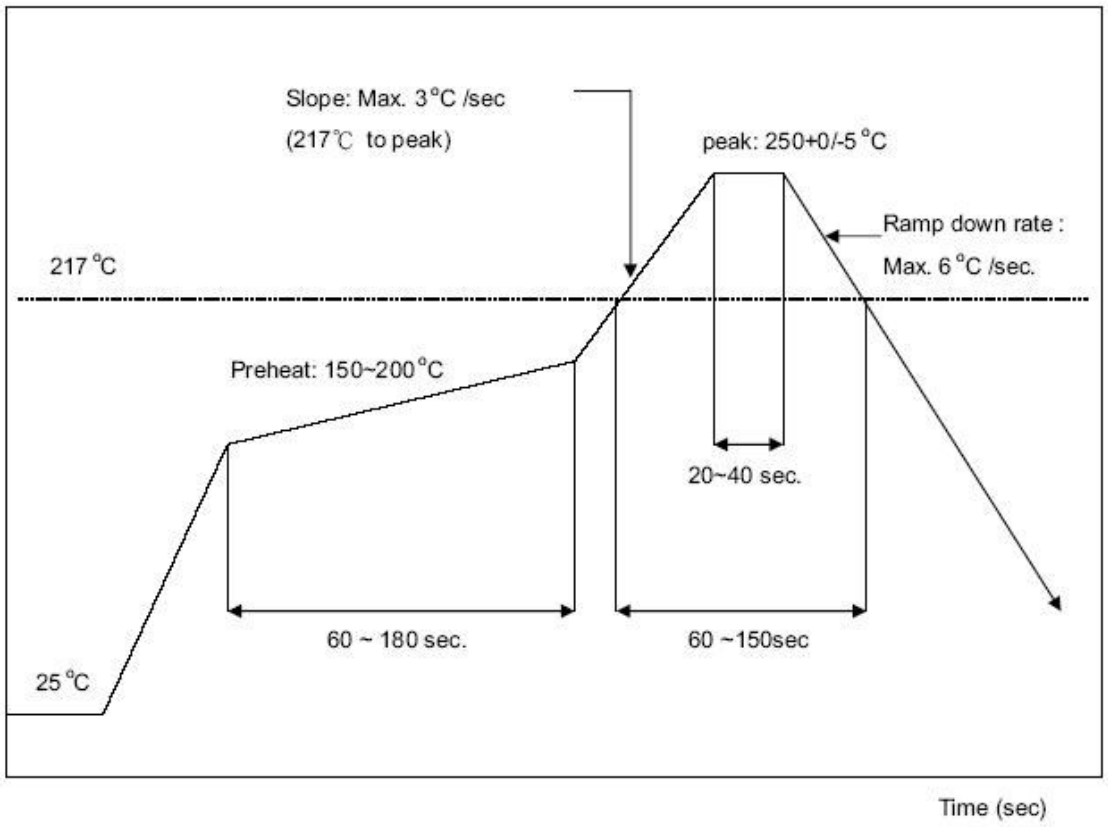
4.4.4 Reel Dimensions



Module type:	A	B	C	N	W (min)
MD-223FA	330 ±1.0	2.2±0.5	13 ±0.2	100 +0.1	55.5 ±0.3

4.5 SMT IR Profile

Average ramp-up rate (217 ℃ to peak): 3 ℃ /sec max.
Preheat：150~200 ℃、60~180 seconds
Temperature maintained above 217 ℃: 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 and testing 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.