



User Manual Documentation

*FCC ID: LW9-PDM
Canada: 2119B-PDM*

Revision	Modified		Checked		Module Name
	Date	By	Date	By	
A	June03-2016	JA	June06-2016	AP	PDM
B	Aug10-2016	JA			
					Description
					Proximity detection module (PDM) is a wireless detection and distance measurement sensor operating at 2.4Ghz.
					Remarks
					Supports configuration via serial interface.
					Item Number
					52451300

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1. PROJECT DESCRIPTION

Proximity Detection Module is an RF module designed to measure the distance between two nodes. The module uses Atmel AT86R233 phase difference measurement function in order to relate change of signal phase with distance. The module operates in the 2.4 GHz band in order to communicate between two paired nodes.

The sensor was designed in order to be integrated with Hetronic standard systems. By adding a PDM module in a transmitter and receiver one can choose the location where the operator has to be in order to operate the system. The user can choose to either operate the system when he is less than a configurable distance to the receiving PDM node or else when he is far away by the selected distance.

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2. BLOCK DIAGRAM

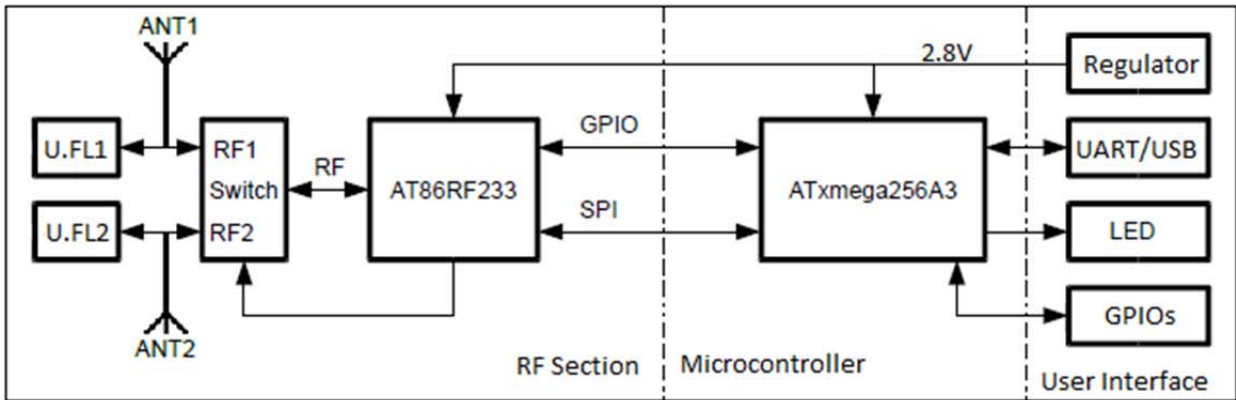




Figure 1: Block Diagram

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3. TECHNICAL SPECIFICATION

Operating Temperature	-20° to +70° Celsius
Storage Temperature	-40° to +85° Celsius
Supply Voltage Range	3-12 VDC, 40mA Max
Communication Interface	UART, USB
Outputs/Outputs	<ul style="list-style-type: none">• 3 configurable IOs• High current open drain output
Accuracy (line of sight)	<5m – 1m accuracy >5m – 2m and above

Table 1: Technical Specifications Details

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4. CONNECTION DIAGRAM

4.1. Board Connections

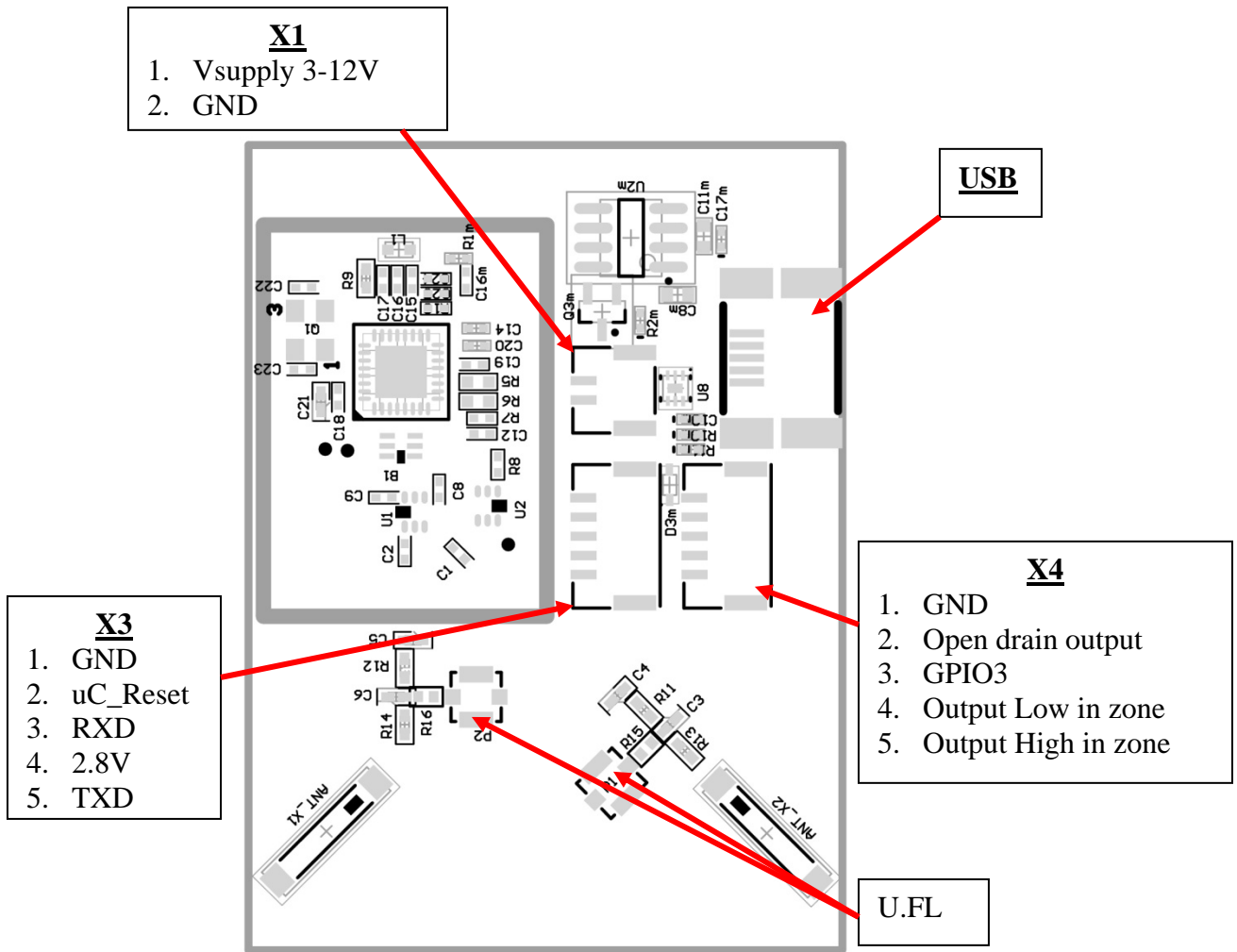



Figure 2: Board Connections

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5. CONFIGURATION PARAMETERS

When connecting with a serial interface to the PDM module one can configure the RF parameters and edit the communications parameters of the sensor. An example of the parameters available is shown below.

```
[PARAM_END]
ay
[PARAM]
Communication Parameters:
c : Channel = 22 [11...26]
o : Own Short Address = 0x0004 (4)
  Own Long Address = 0xFFFFFFFFFFFFFFF
i : Initiator Short Address for Remote Ranging = 0x0001 (1)
I : Initiator Long Address for Remote Ranging = 0x000425FFFFF175C7D
r : Reflector Short Address = 0x0003 (3)
R : Reflector Long Address = 0x000425FFFFF175C9D
P : PAN_Id = 0xEFAC (61356)
s : Ranging Addressing Scheme = 0 [0,1,2,3]
  (0 - Initiator short address, Reflector short address)
  (1 - Initiator short address, Reflector long address)
  (2 - Initiator long address, Reflector short address)
  (3 - Initiator long address, Reflector long address)
g : Coordinator Addressing Mode = 2 [2,3]
  (2 - Short address)
  (3 - Long address)

Ranging Parameters:
n : Filtering length during continuous Ranging = 2 [1...16]
f : Filtering method for continuous Ranging = Min. of distance and DQF considering variance
d : Default Antenna = 0 [0,1] (AD disabled only)
a : Antenna Diversity = 1 [0,1]
e : Provide all Measurement Results = 0 [0,1]
w : Apply Minimum Threshold during weighted Distance Calc = 1 [0,1]
  Ranging Method = 1 -> PMU based on AT86RF233
1 : Frequency Start = 2403 MHz [2324...2527]
2 : Frequency Step = 3 -> 4.0 MHz [0,1,2,3]
3 : Frequency Stop = 2525 MHz [2324...2527]
  Distance Offset = -50 cm

Misc. Parameters:
v : Verbose = 0 [0...1]

Radio Parameters:
t : Tx Power during Ranging = 4 dBm
T : Provide Ranging Tx Power for next Ranging = 0 [0,1]
z : Distance limit = 400 cm
[PARAM_END]
```

Figure 3: PDM configuration parameters

Addresses can be configured via the serial interface and go up to a sixteen bit value. The address for the receiver has to be the same as the transmitter address plus one. The receiver address has to be updated as the reflector short address in the transmitter and own short address in the receiver.


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Table 2: PDM configuration parameters

Communication parameters		
Command	Description	Comment
c	Channel	IEEE802.15.4 channel for basic communication between nodes [11,12,..26]
o	Own Short Address	Node Short address. Used when doing local ranging.
i	Receiver short address	Receiver short address for local ranging.
p	PAN-ID	PAN-ID of ranging network
s	Ranging Addressing scheme	0 – Transmitter short address, receiver short address
g	Adressing Mode	2 – Short address
Ranging Parameters		
n	Filtering length during continuous ranging	Value > 1 starts a continuous ranging with filter depth of n. Stopped by entering ‘m’ or ‘M’
f	Filtering method for continuous ranging	Filtering methode applied during continuous ranging (n!=1)
d	Default Antenna	Utilized default antenna in case antenna diversity is switched off [0,1]
a	Antenna diversity	Utilization of antenna diversity is supported by the PAL[0,1]
1	Frequency start	Ranging measurement start frequency in MHz [2324 – 2527]
2	Frequency Step	Ranging measurement frequency step mapping [0..3]
3	Frequency stop	Ranging measurement stop frequency in MHz [2324 – 2527]
Radio Parameters		
t	Tx Power during Ranging	TX power in dBm utilized during the actual ranging measurement cycle [-17...4]
z	Distance limit	The distance value that you want to set and monitor.

5.1. LED Description

Table 3: PDM LEDs

LED	Color	Description
LED1	Red	Power supply is on
LED2	Yellow	Blinking once module starts

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6. PROGRAMMING CONFIGURATION AND TESTING PROCEDURE

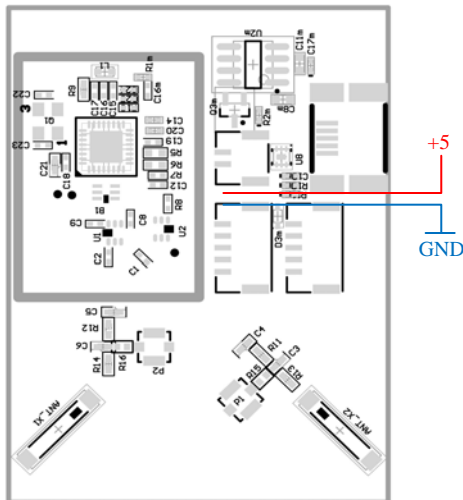
[Tools Needed / Requirements]

- [Putty software](#)
- [Atmel Flip software](#)
- USB to Uart converter cable
- Atmel Studio
- Atmel ICE with JTAG adaptor
- Mini USB cable

1. Connect supply to X1 and see that current consumption is between 30-40mA.
2. Open Putty and connect USB to TTL converter cable to connector X2 as shown below.

[Test Set-Up]

Sample Module



Module under test

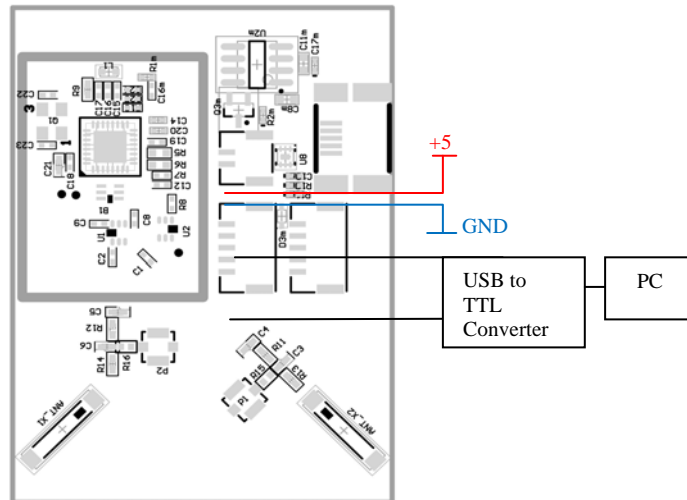



Figure 4: Test setup

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- Set the putty baud rate to 38600kb/s and select the COM port of the USB converter and press Open.

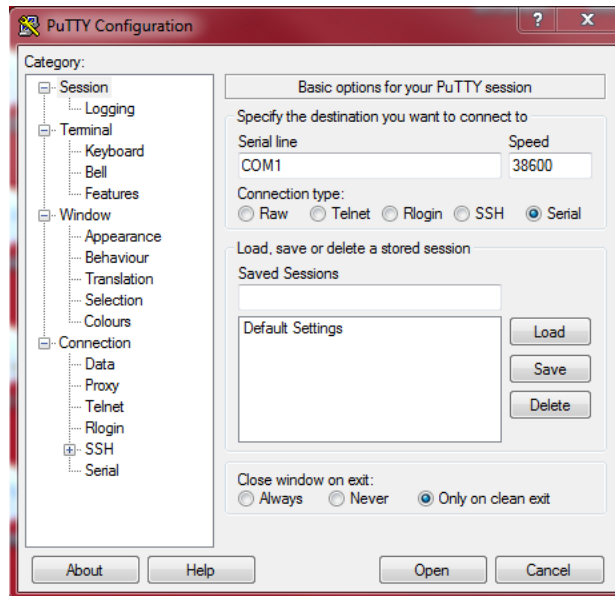


Figure 5: Opening putty application

- A blank black screen should appear. When pressing 'p' on the PC the following details should be seen.

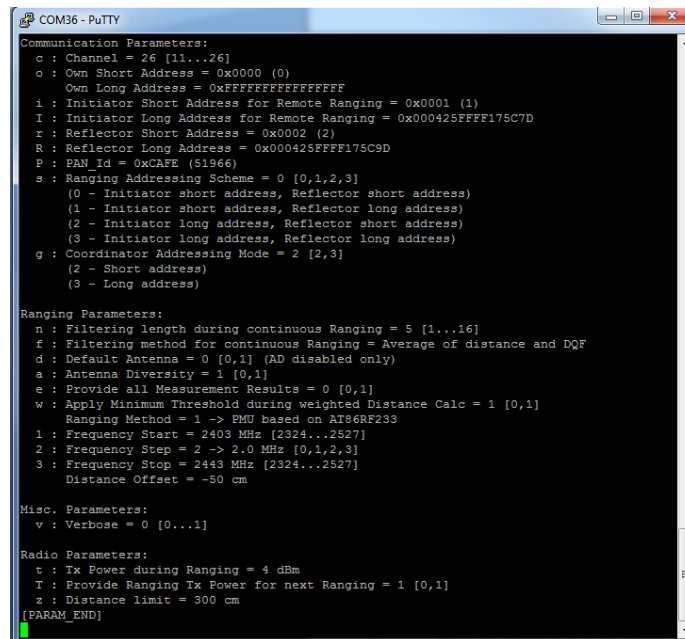



Figure 6: Configuration parameters

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5. If the letter 'm' is now pressed on the keyboard then in the Putty terminal various measurements should start being seen.

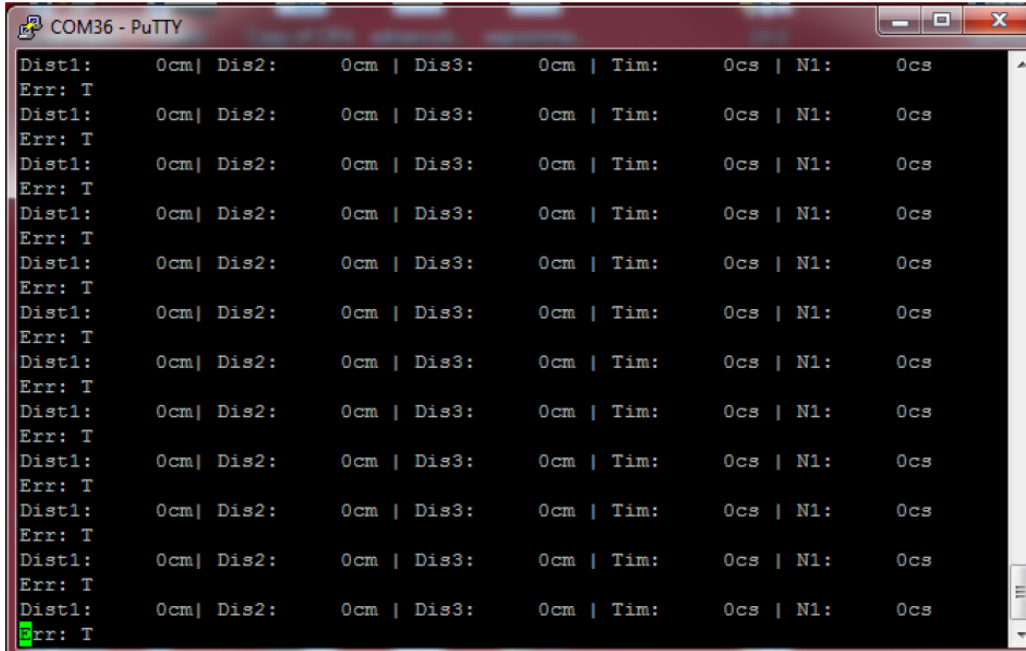



Figure 7: PDM continuous ranging

7. REVISION HISTORY

Rev A

- Initial Document, HM0015R02

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