Machine To Cloud Solutions

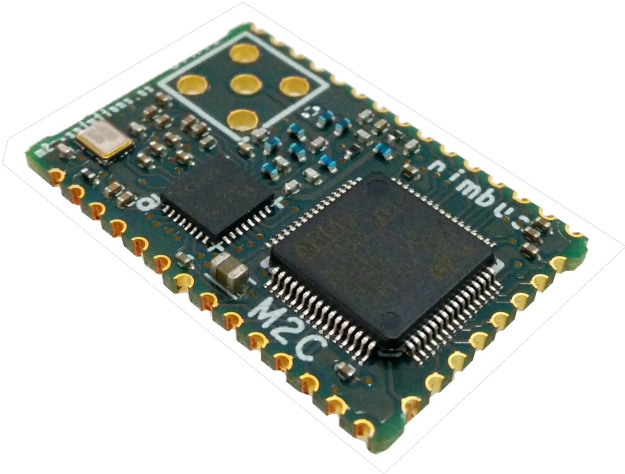
M2C NIMBUS

Datasheet
Ref. M2C NIMBUS
Rev. 1.0

Machine To Cloud Solutions, S.L.
www.m2cs-solutions.es
info@m2c-solutions.es

Applications

Home & building automation, Wireless sensor network, Data acquisition equipment, mobile health, industrial monitor and control, wireless metering, Internet of things (IoT)



Features

- Module based on:
  - STM32L100RB
  - CC1200 Transceiver
- Transmission power: +14dBm
- Frequency: 868/915 MHz
- Power: 2 to 3,5 VDC
- Consumption @ 3,3V
  - Tx +14dBm: 68 mA
  - Rx: 30 mA
- Ultra low power sleep mode @ 2V. Consumption 1 uA.
- Range: up to 300 m
- Bit rate: up to 625 kbps
- Rx sensitivity: -109 dBm (50 kbps)
- Standard: IEEE 802.15.4g
- SMD footprint
- Antenna options: SMA

Mechanicals

- Dimensions: 20 x 30 mm

Operating environment

- Temperature: -40ºC to +85ºC
- Humidity: 10 to 90%HR

Part numbers

- NIMBUS-868
- NIMBUS-915

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Description

The M2C NIMBUS-868 and M2C NIMBUS-915 are ultra-low power and fully integrated RF modules operating respectively in the 868 MHz SRD and 915 MHz ISM bands.

The M2C Nimbus mote is a module designed to speed up time-to-market of RF products. although it can work as a simple UART - RF bridge, its main advantage is that it can also be used as the microcontroller of the system, forgetting about the RF part, which is offered as a library for developers. This provides both, easy design and lower cost than using a UART - RF bridge since a second microcontroller is not necessary.

It is based on the inexpensive, but powerful STM32L100RB microcontroller. It has different serial communications such as USB, I2C, SPI and USART, Real Time Clock, System Clock up to 32 MHz, several timers, ADC, DAC and DMA. Furthermore, its ultra low power mode with consumption down to 1 uA makes it suitable for battery powered products.

Hardware specification

Recommended operating conditions

Symbol	Parameter	Min	Typ	Max	Unit
T_A	Operating ambient temperature range	-40	-	85	ºC
V_{DD}	Operating supply voltage	2	3,3	3,5	V
FREQ	RF frequency (NIMBUS-868)	863	-	870	MHz
FREQ	RF frequency (NIMBUS-915)	902	-	928	MHz

Absolute maximum ratings

Symbol	Parameter	Min	Typ	Max	Unit
T_{STG}	Storage temperature range	-40	-	85	ºC
V_{DD}	Operating supply voltage	-0,3	-	3,9	V
V_{IO}	I/O pin voltage	-0,3	-	3,9	V

I/O operating characteristics

Symbol	Parameter	Min	Typ	Max	Unit
V_{IL} (1)	I/O input low level voltage	-0,3	-	0,3 V_{DD}	V
V_{IH} (1)	I/O input high level voltage	0,7 V_{IN}	-	V_{DD}+0,3	V
I_{IO}	Current sourced/injected by any I/O	-	-	25	mA

1. For more details see the STM32L100RB datasheet, I/O port characteristics

Current consumption

Symbol	Parameter	V_{DD}	Typ	Unit
I_{DD}	Supply current Tx +14 dBm, 868 MHz	3,3 V	68	mA
	Supply current Rx mode, 868 MHz	3,3 V	30	mA
	Low Power mode	2 V	1	uA

Please check the images below (Fig 1, Fig 2 and Fig 3) for more information about current consumption.

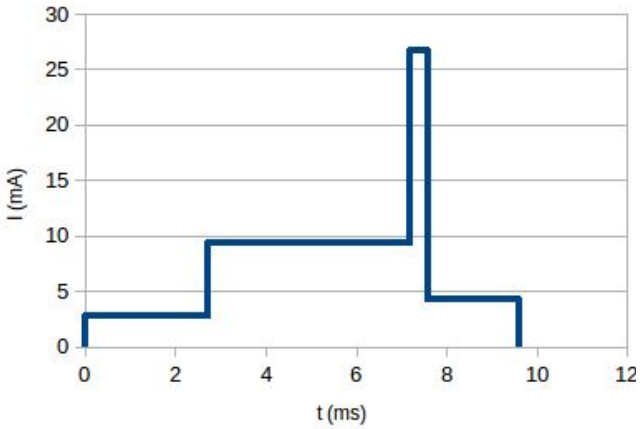


Fig 1. Wakeup Pulse. 3,3V @ 25ºC

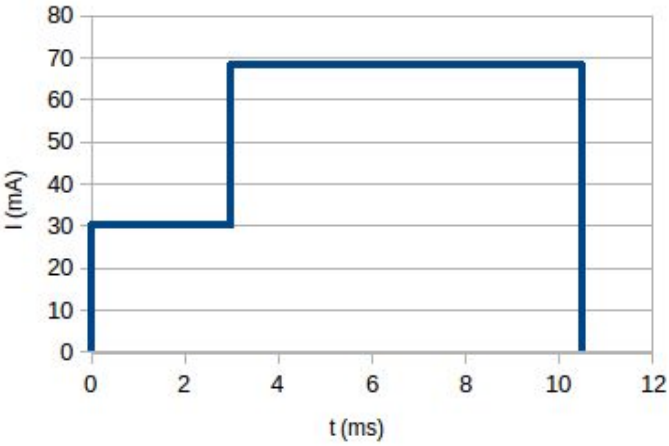


Fig 2. Sample of TX application. 3,3V @ 25ºC

Fig 1 shows the typical consumption curve when waking up and then going immediately to low power again

Fig 2 shows a sample consumption curve for a typical low power RF application. Waking up, doing some stuff, RF Tx and then going to low power mode.

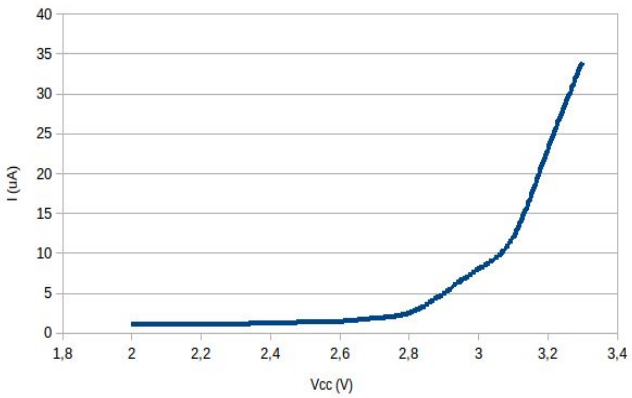


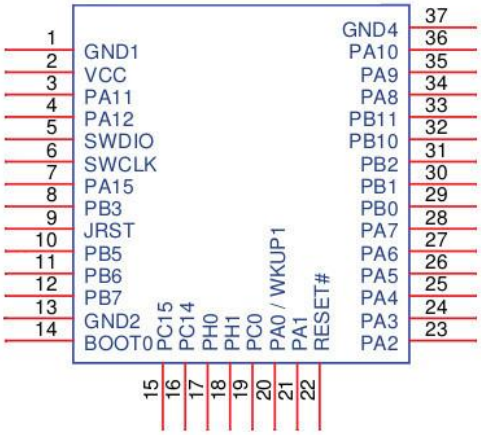
Fig 3. Sleep mode consumption vs V_{DD} @ 25ºC

Fig 3 shows the V_{DD} vs I_{DD} in low power mode. As shown, current consumption dramatically decreases when V_{DD} is under 3 V. For lowest current consumption V_{DD} = 2V is suggested.

Therefore, a selectable output, low power switched regulator is suggested if current consumption is critical.

Pin assignment

This is a brief description of the M2C Nimbus pinout. All pins are directly connected to the corresponding pin of the STM32L100RB microcontroller. If further information about functionalities is required, please refer to STM32L100RB datasheet or reference manual from ST webpage.



Pin	Name	Type	Description	STM32L pin
1	GND	Power	Ground	-
2	VCC	Power	Supply input voltage	-
3	PA11	I/O	General purpose I/O(1)	PA11
4	PA12	I/O	General purpose I/O(1)	PA12
5	SWDIO	I/O	JTMS-SWDIO	PA13
6	SWCLK	I	JTMS-SWCLK	PA14
7	PA15	I/O	JTDI	PA15
8	PB3	I/O	JTDO	PB3
9	JRST	I	JRST	PB4
10	PB5	I/O	General purpose I/O(1)	PB5
11	PB6	I/O	General purpose I/O(1)	PB6
12	PB7	I/O	General purpose I/O(1)	PB7
13	GND	Power	Ground	-
14	BOOT0	I	BOOT0	BOOT0
15	PC15	I/O	General purpose I/O(1)	PC15
16	PC14	I/O	General purpose I/O(1)	PC14

Pin	Name	Type	Description	STM32L pin
17	PH0	I/O	General purpose I/O(1)	PH0
18	PH1	I/O	General purpose I/O(1)	PH1
19	PC0	I/O	General purpose I/O(1)	PC0
20	PA0	I/O	General purpose I/O(1)	PA0
21	PA1	I/O	General purpose I/O(1)	PA1
22	#RST	I	Active low reset	NRST
23	PA2	I/O	General purpose I/O(1)	PA2
24	PA3	I/O	General purpose I/O(1)	PA3
25	PA4	I/O	General purpose I/O(1)	PA4
26	PA5	I/O	General purpose I/O(1)	PA5
27	PA6	I/O	General purpose I/O(1)	PA6
28	PA7	I/O	General purpose I/O(1)	PA7
29	PB0	I/O	General purpose I/O(1)	PB0
30	PB1	I/O	General purpose I/O(1)	PB1
31	PB2	I/O	General purpose I/O(1)	PB2
32	PB10	I/O	General purpose I/O(1)	PB10
33	PB11	I/O	General purpose I/O(1)	PB11
34	PA8	I/O	General purpose I/O(1)	PA8
35	PA9	I/O	General purpose I/O(1)	PA9
36	PA10	I/O	General purpose I/O(1)	PA10
37	GND	Power	Ground	-

1. For further information about general purpose I/O please refer to STM32L100RB datasheet

Pin usage

There are a few considerations while interfacing the M2C Nimbus mote module with custom hardware.

All general purpose I/O pins can be used as an I/O pin or as its alternate function such as I2C, USART, ADC, DAC or SPI. Please check the STM32L100RB datasheet for more information about those functionalities.

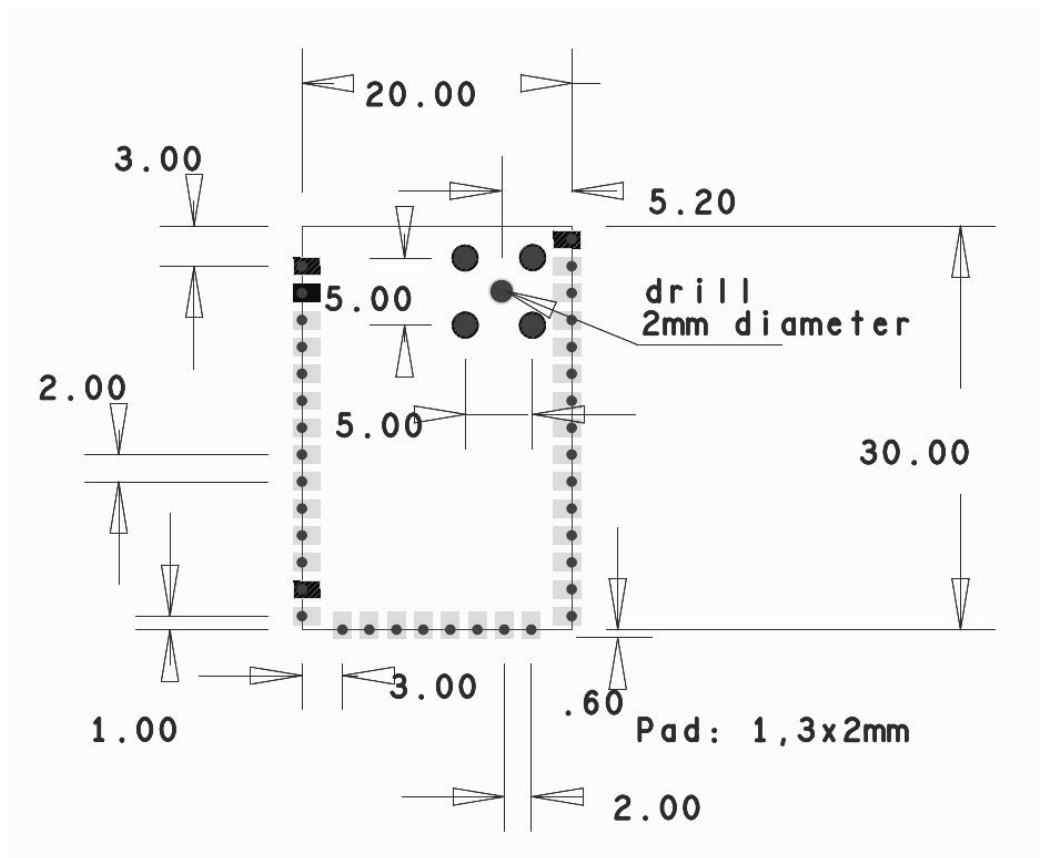
All GND pins must be connected to ground.

BOOT0 Pin must be terminated and pulled-low

#RST Pin is internally pulled-up. It is not necessary to terminate this pin.

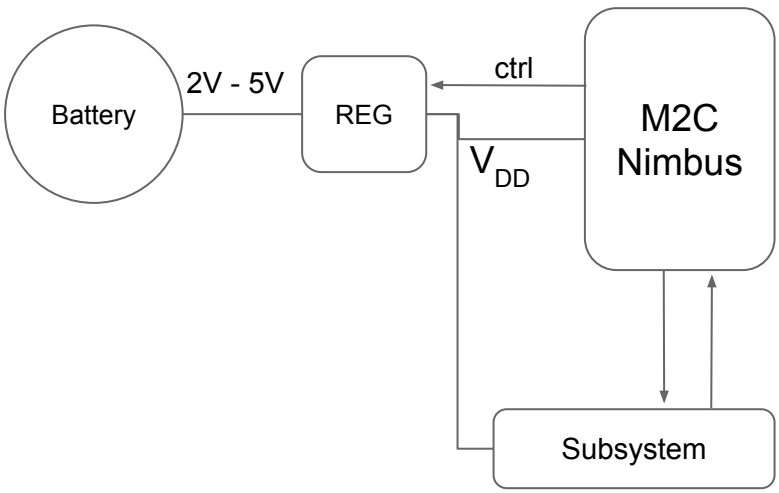
SWDIO, SWCLK, JTDI, JTDO and JRST pins are used for programming and debugging purposes. Please check “M2C Nimbus mote programming” section for more information about this process.

Recommended footprint



Low power wireless sensor reference design

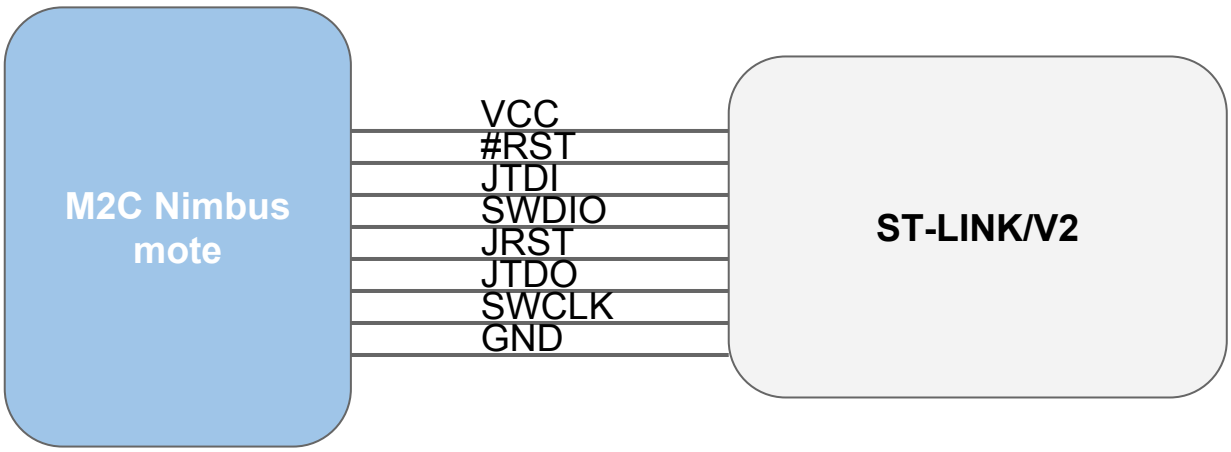
The image below shows the typical hardware scheme for battery operated, low power wireless devices, commonly used in wireless sensors. As suggested in the “hardware specification” section, a selectable output, super low power quiescent current, switched regulator is recommended to reduce current consumption by decreasing V_{DD} to 2V.



M2C Nimbus mote Programming

The module is programmed by using the ST-LINK/V2 in-circuit debugger/programmer for STM32 microcontroller families. Here is explained how to connect this programmer to the M2C Nimbus mote, for more information about the ST-LINK/V2 check the ST user manual UM1075.

This is the recommended connection scheme for programming/debugging the module



Machine To Cloud Solutions, S.L.

C/ La Bañeza 43 - L6

28035 - Madrid

Tlf: (+34) 911633522

www.m2c-solutions.es

info@m2c-solutions.es