# EMB-WMB series
# 169/868 MHz
# Wireless M-Bus Modules

**EMB-WMB** is a series of modules developed by Embit's for the Wireless M-Bus market. Different modules offer solutions for 169 MHz and 868 MHz. The modules combine high performance to small dimensions and low cost, providing the system integrator a simple and easy way to add WMBus connectivity and multi-hop networking into existing products. The module is configured as an embedded micro system or simple data modem for low power applications in the metering specifically allocated band of 169 MHz or in the ISM band of 868 MHz. The device is a general purpose module and can be configured for interoperability in a WMBus network.

The RF implementation guarantees best-in-class performance in terms of covered area and power consumption. The output power can be increased up to +30 dBm on the EMB-WMB169PA, up to +27 dBm on the EMB-WMB169PAE (optimized version for highest power efficiency) and up to +15 dBm on the EMB-WMB868. All the possible configurations work on a **single power supply rail (3.3 V)**. The power amplifier of the PA version can also be bypassed for saving power during transmission in those situations where +15 dBm are enough. Speaking of sensitivity, the results depend on the modulation and data rate in use and can achieve -122 dBm. An accurate frequency reference (instead of the standard crystal oscillator) is provided for the 169 MHz versions in order to allow the device to meet the strict requirements imposed by the EN-13757 in terms of frequency accuracy and drift.

Any **EMB-WMB** module can communicate with other devices through a wide range of serial interfaces: UART, I2C and SPI, several digital and analog I/O ports. One of the main targets of the **EMB-WMB** platforms is the flexibility. Being an open platform it allows the customer to define specific interfaces as well as use well known protocols (WMBus as an example). The extremely reduced power consumption gives access to those long lasting battery life requirement imposed by the metering market (up to 2 µA in sleep mode with an RTC clock running).

The **EMB-WMB** modules can be provided with a **W-MBus stack** specifically **developed by Embit** for the platform that allows to integrate the module in the desired system without effort and simplify the interaction in WMBus networks.

## M-Bus wireless

Embit form-factor
TCXO  **+30 dBm (1 W)**
Pin to pin compatible
**Single supply**  ebi protocol

## TECHNICAL SPECIFICATIONS

| | |
|---|---|
| MCU | MSP430F534x |
| Memory | 64/96/128 KB Flash, 6/8/10 KB RAM |
| Frequency | 169 MHz or 868 MHz |
| Modulation | FSK, GFSK, MSK, ASK, OOK |
| Voltage supply | 3.3 V  (single supply) |
| Tx output power | up to +30 dBm (EMB-WMB169PA) up to +27 dBm (EMB-WMB169PAE) up to +15 dBm (EMB-WMB868) |
| Rx sensitivity | up to -122 dBm |
| Tx current EMB-WMB169PA | 600 mA (at +27 dBm) |
| Tx current EMB-WMB169PAE | 390 mA (at +27 dBm) |
| Tx current EMB-WMB868 | 57 mA (at +15 dBm) |
| Rx current | 27 mA (full sensitivity) < 2 mA (long preamble) |
| Sleep current | < 2 µA |
| Data rate | up to 19.2 kbps at 169 MHz up to 200 kbps at 868 MHz |
| Interfaces | GPIO, UART, ADC, SPI, I2C, TIMER/PWM, JTAG |
| Antenna | U.FL connector, Wire antenna Pads on edge connector |
| Dimensions | 29.5x22.5x3.5 mm Usual embit form factor & pin to pin compatibility |
| Connector | SMD Edge connector |
| Temperature Range | -40 ÷ +85 °C |

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The **EMB-WMB modules** come in different flavours to best fit the customer's requirements. The cost and performances trade off can be tweaked with multiple approaches.

The module is based on an MSP430 microcontroller which can be mounted in different memory sizes.

The transceiver can be clocked by a crystal oscillator (for cheaper solutions) or by an extremely **accurate TCXO** (for those applications with more strict frequency accuracy constrains).

An optional power amplifier that further increases the RF output power up to **+30 dBm** is also available for the 169 MHz version.

Last but not least, different antenna connectors can be chosen (U.FL connector, wire antenna and ground-signal-ground pads).

The **EMB-WMB** modules can be adopted for developing any custom wireless protocol or can be used with the **Wireless M-Bus stack** provided by Embit which implements all the lower layer of WMbus according to the EN-13757 for the following modes: **N (169 MHz), S, T, R2, C (868/869 MHz).**
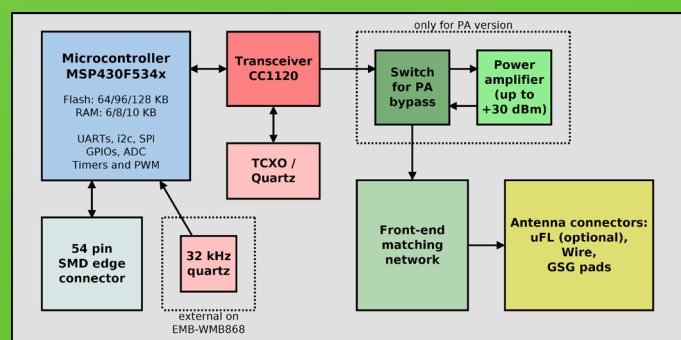


The stack already deals automatically the strict timings aspects imposed by the standards for synchronized transmissions in order to save as much power as possible. The module also provides firmware update functionalities as well as CRC and address check/insert for every packet. Multihop networks are also feasible.

The host can implement any desired layer on top of the stack, embedding the application on the module or exchange data through a UART port with simple commands leaving all the complexity of the wireless communication to the stack.
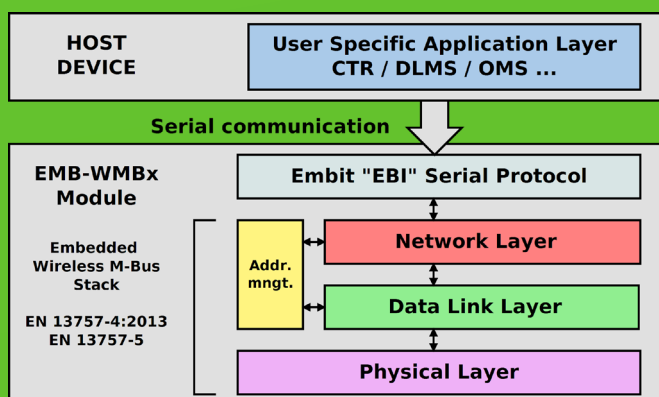


## EMB-WMB modules comparison

| Module | Operating Frequency | Clock | 32kHz Quartz | Max. TX power |
|---|---|---|---|---|
| EMB-WMB169PA | 169 MHz | TCXO | YES | +30 dBm |
| EMB-WMB169PAE | 169 MHz | TCXO | YES | +27 dBm |
| EMB-WMB868 | 868 MHz | Quartz | NO | +15 dBm |

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