# EMB-Z2538PA

**PRELIMINARY**

**Datasheet**

**FCC ID: Z7H-EMB2538PA**

The device complies with part 15 of the FCC Rules. Operation is subjected to the following 2 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.

# Document information

## Versions & Revisions

| Revision | Date | Author | Comments |
|---|---|---|---|
| 0.9 | 23/10/2013 | AS | Preliminary version |
| 1.0 | 25/10/2013 | FM | Added typical appl. circuit; current measurements; minor changes |
| 1.1 | 20/05/2014 | FM | Added mention of Olimex programmer |
| 1.2 | 17/02/2015 | CB | Updated sensitivity |
| 1.3 | 18/11/2015 | CB | Updated FCC information |
| 1.4 | 08/01/2016 | CB | Updated FCC information |
| | | | |

## References

| Ref | Version | Date | Author | Title |
|---|---|---|---|---|
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# Index

# 1 Description

**EMB-Z2538PA** is an OEM wireless module developed by **embit** for Low-Rate Wireless Personal Area Networks (LR-WPAN) applications. The module combines high performance to small dimensions and low cost, providing the system integrator a simple and easy way to add IEEE 802.15.4 / ZigBee® low range wireless connectivity and multi-hop networking into existing products.

**EMB-Z2538PA** is configured as an embedded micro system or simple data modem for low power applications in the 2.4 GHz ISM band. It is based on a Texas Instruments™ CC2538 single chip device which is an ARM Cortex™-M3 32 bit microcontroller with up to 512 KB of FLASH memory and 32 KB of RAM. The **EMB-Z2538PA** includes a hardware accelerator for the MAC layer (IEEE 802.15.4) and a 2.4 GHz transceiver.

The ad-hoc RF section includes a power amplifier and a low noise amplifier and delivers best-inclass performance in terms of covered area and power consumption. The output power can be increased up to +22 dBm by simple software configurations and the sensitivity is configurable between two options, allowing to cover distances up to 500 meters (LoS); the U.FL receptacle allows the connection of an external antenna.

**EMB-Z2538PA** can communicate with other devices through a wide range of serial interfaces: two UART ports, SPI, several digital I/O ports (up to 15 digital lines) and one analog port.

## 1.1 Specifications

- 32-bit ARM Cortex™-M3 MCU
- Up to 512 KB of Flash, 32 KB of RAM (of which 16 KB retention in all power modes)
- (optional) Internal additional 64 KB of RAM over SPI
- (optional) Internal 32768 Hz quartz
- Output power: up to +22 dBm (100 mW)
- Sensitivity: up to -101 dBm (high sensitivity mode)
- PCB antenna (PIFA), wire connector and U.FL receptacle for external antennas
- Coverage: up to 500 meters (LoS)
- Unique IEEE address (64 bit) on-board
- SMD edge connector

## 1.2 Applications

- **Metering**: thermostat, meters, remote devices, displays, central devices, etc..
- **Home/Buildings Automation**: safety systems and access control, HVAC, door/window control, lightning, etc..
- **Industrial Automation**: process control, wireless sensor networks, identification and asset tracking, etc..
- **Healthcare**: blood pressure monitoring, thermometers, ECG, etc..

## 1.3 Block diagram

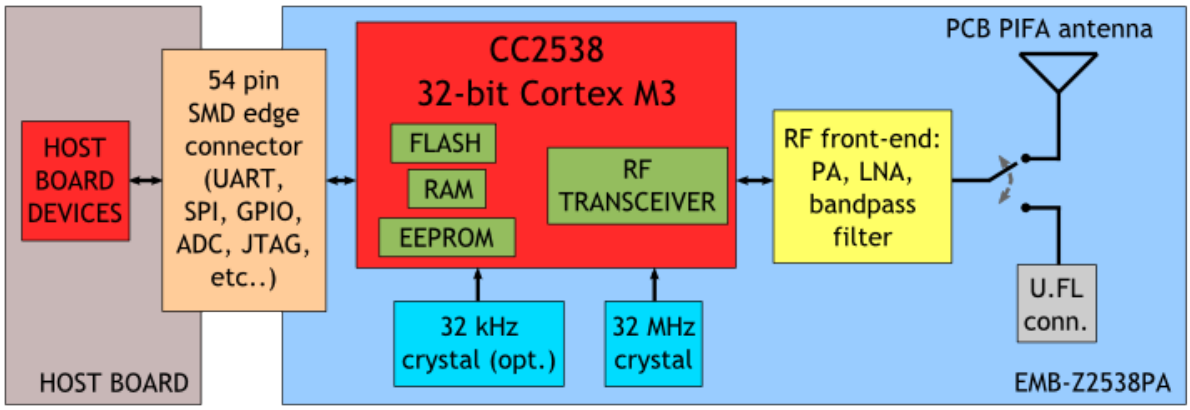



***Image 1**: block diagram for the **EMB-Z2538PA***

## 1.4 Microcontroller

**EMB-Z2538PA** is equipped with the latest System-On-Chip (SOC) from Texas Instruments™: the CC2538. The CC2538 is an integrated platform for IEEE 802.15.4 applications or ZigBee® applications. The device integrates a low power 2.4 GHz transceiver, an MCU based on an ARM Cortex-M3 core (32 bit) and a hardware accelerator for the IEEE 802.15.4 MAC layer.

The CC2538 can be used for different wireless applications, starting from simple point to point proprietary protocols up to ZigBee® self-healing mesh networks, and is conceived to offer high computational power but low power consumption. It targets in particular smart metering applications.

The ARM Cortex-M3 32 bit core works at 32 MHz and supports the Thumb-2 instruction set; it is coupled with 512 KB of FLASH memory and 32 KB of SRAM memory.

## 1.5 Antenna

The **EMB-Z2538PA** module offers two different antenna options:

- PIFA antenna directly printed on the PCB. The performances of this antenna are influenced by the positioning of the module in the system. The antenna specifications are provided in next paragraph.
- External antenna connector: 50 Ohm single ended U.FL connector.

### 1.5.1 Antenna options /type

The module EMB-Z2538PA is provided in two alternative antenna output configurations that corresponds into two different part numbers:

**EMB-Z2538PA/IA** that operates with the integrated PCB PIFA antenna, this P/N can be identified by the position of the 0402 resistor (zero R) in the RF chain (the one closer to the printed antenna) as shown in the following picture, U.FL connector is not mounted:

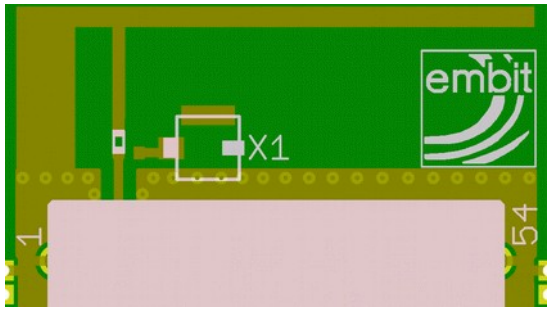



***Image 6: EMB-Z2538PA/IA**, positioning of zero Ohm resistor*

**EMB-Z2538PA/UL** that operates only with one of the external antenna present in *"Chapter 7.2 Compliance: Important information"*.

This P/N can be identified by the horizontal position of the 0402 resistor (zero R) in the RF chain (the one closer to the printed antenna) as shown in the following picture, U.FL connector is mounted (mandatory):

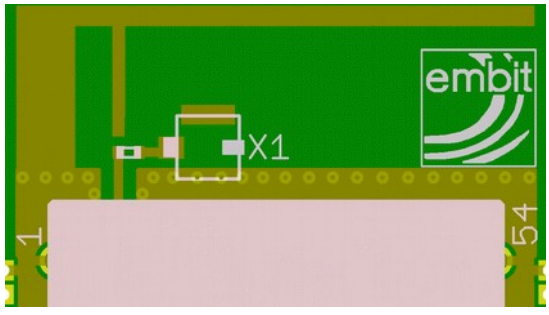



***Image 7: EMB-Z2538PA/UL**, positioning of zero Ohm resistor*

For additional information on part-numbering, antenna option and antenna permitted refer to the right section present in that datasheet. Power Amplifier / Low Noise Amplifier

The **EMB-Z2538PA** module is equipped with a PA / LNA combination to increase the communication range of the device. The PA provides a fixed gain of +24 dB and the LNA can provide a gain of +11 dB or +6 dB selectable from the MCU. To switch between low gain and high gain the MCU must drive the appropriate pin described in section “Power Amplifier Interface”.

### 1.5.2 PIFA antenna

The printed antenna of the **EMB-Z2538PA** is a simple and performant solution for a 2.4 GHz system. It has a maximum gain of -2 dBi.

## 1.6 Firmware

The **EMB-Z2538PA** is compatible with the TIMAC stack (which can be used to develop IEEE 802.15.4-based applications) and the Z-STACK (which can be used to develop ZigBee® applications) provided by Texas Instruments™. Some configuration to these stacks are required in order to drive the PA and LNA available on the EMB-Z2538PA, as described below.

### 1.6.1 Power Amplifier Interface

The **EMB-Z2538PA** has an integrated power amplifier (PA) and low noise amplifier (LNA) that must be controlled by the transceiver. Depending on the stack some modifications might be required in order to control the front-end. The interface between transceiver and front-end is composed of an SPI port and three GPIO pins: "Enable", "PA_enable" and "Low/High_Sensitivity".

The "Enable" pin (for controlling the LNA) is remapped to PC2 while the "PA_enable" pin is remapped to PC3. The right settings for OBSSEL3 and OBSSEL2 must be changed in mac_radio_defs.c of the TIMAC stack:

```
/* PC3 -> PAEN */
RFC_OBS_CTRL0 = RFC_OBS_CTRL_PA_PD_INV;
OBSSEL3       = OBSSEL_OBS_CTRL0;

/* PC2 -> EN (LNA control) */
RFC_OBS_CTRL1 = RFC_OBS_CTRL_LNAMIX_PD_INV;
OBSSEL2       = OBSSEL_OBS_CTRL1;
```

More information is available in the documents provided with the EMB-Z2538PA-EVK, or you can contact Embit firmware support.

### 1.6.2 Texas Instruments stack configuration

The Texas Instruments™ stacks needs to be customized in order to support the EMB-Z2538PA. The modifications includes the pin configuration, the 32 kHz configuration, and the power amplifier selection (the definitions HAL_PA_LNA and HAL_PA_LNA_CC2592 must enabled).

Depending on the board in which the EMB-Z2538PA module will be mounted, some remapping in the TIMAC/Z-stack firmware of the defines controlling LEDs and pushbuttons might be required.

More information is available in the documents provided with the EMB-Z2538PA-EVK, or you can contact Embit firmware support.

### 1.6.3 USARTs and Other Peripherals Routing

The CC2538 MCU allows to route the internal peripherals signals (e.g., uart, spi, …) to different GPIOs. Refer to section “General-Purpose Inputs/Outputs” of the document “CC2538 SoC for 2.4-GHz IEEE 802.15.4 & ZigBee/ZigBee IP Apps User's Guide (Rev. C)”.

Please note that the default configuration of the CC2538 is different than the Standard Embit Pinout.

## 1.7 Development Tools

To program the EMB-Z2538PA any programmer compatible with the TI ARM Cortex-M3 architecture can be used. Embit suggests the use of Segger J-Link/J-Trace debug probes or a TI XDS100v3 compatible programmers (e.g., the Olimex TMS320-XDS100-V3).

It is important to note that the IAR Embedded WorkBench for ARM IDE is needed to develop applications employing the Texas Instruments™ TIMAC and Z-Stack firmware packages.

# 2 Size and footprint

## 2.1 Size

The mechanical dimensions of the **EMB- Z2538PA** are identical to the dimensions of all other Embit modules: 29.50 x 22.60 mm. The thickness is 3.6 mm (CAN Shield included).

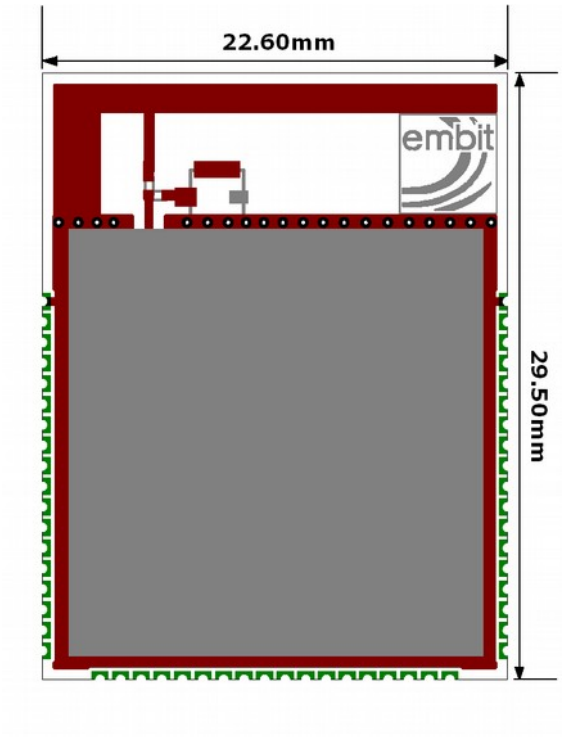



***Image 8:*** *Outline*

## 2.2 Connector positioning

The **EMB-Z2538PA** module has three 18 pin “edge” connector with a 1.00 mm pitch, for a sum of 54 contacts. Each pin is a metalized half hole 0.50 mm in diameter. The positioning of the connector is shown in the following images:

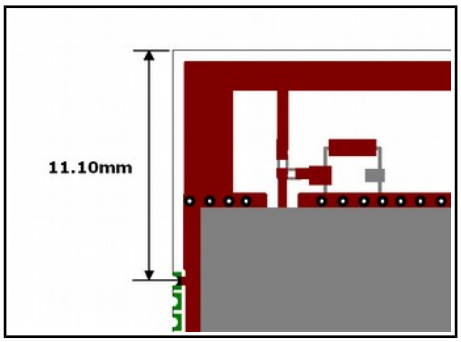



***Image 9**: Connector positions*

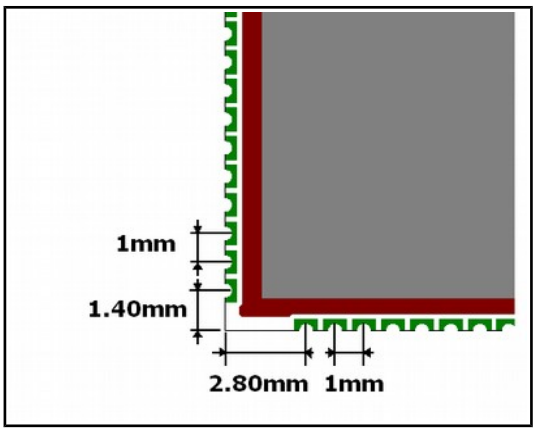



***Image 10**: Connector positions*

## 2.3 Footprint

The **EMB-Z2538PA** footprint consists of 54 SMD pads with size 1.00 x 0.80 mm positioned as following:

***Image 11**: Footprint **EMB-Z2538PA***

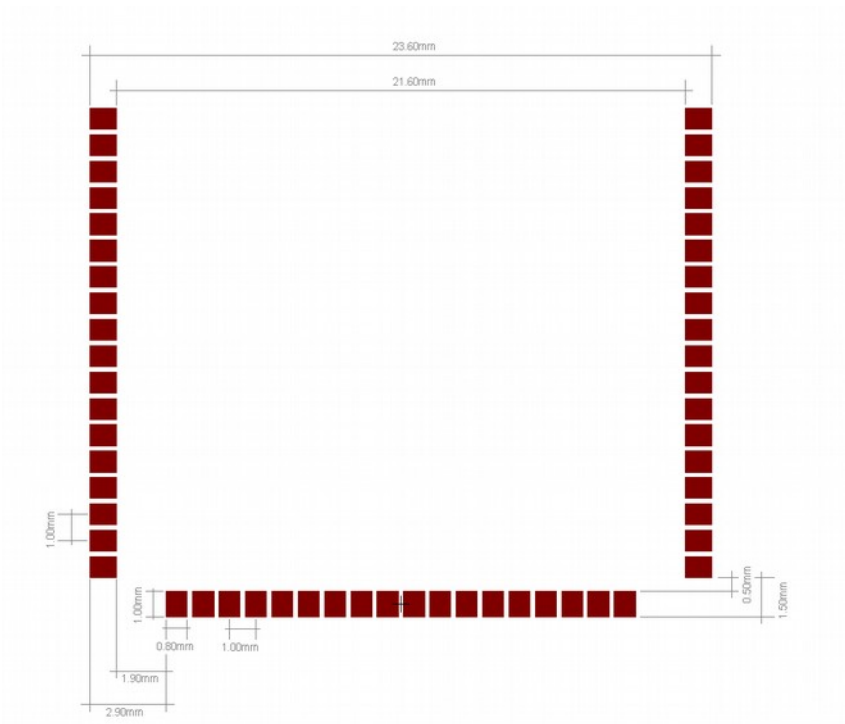



***Image 12**: Pad distribution*

The suggested layout for the pin/pads of the **EMB-Z2538PA** is shown in the following image:

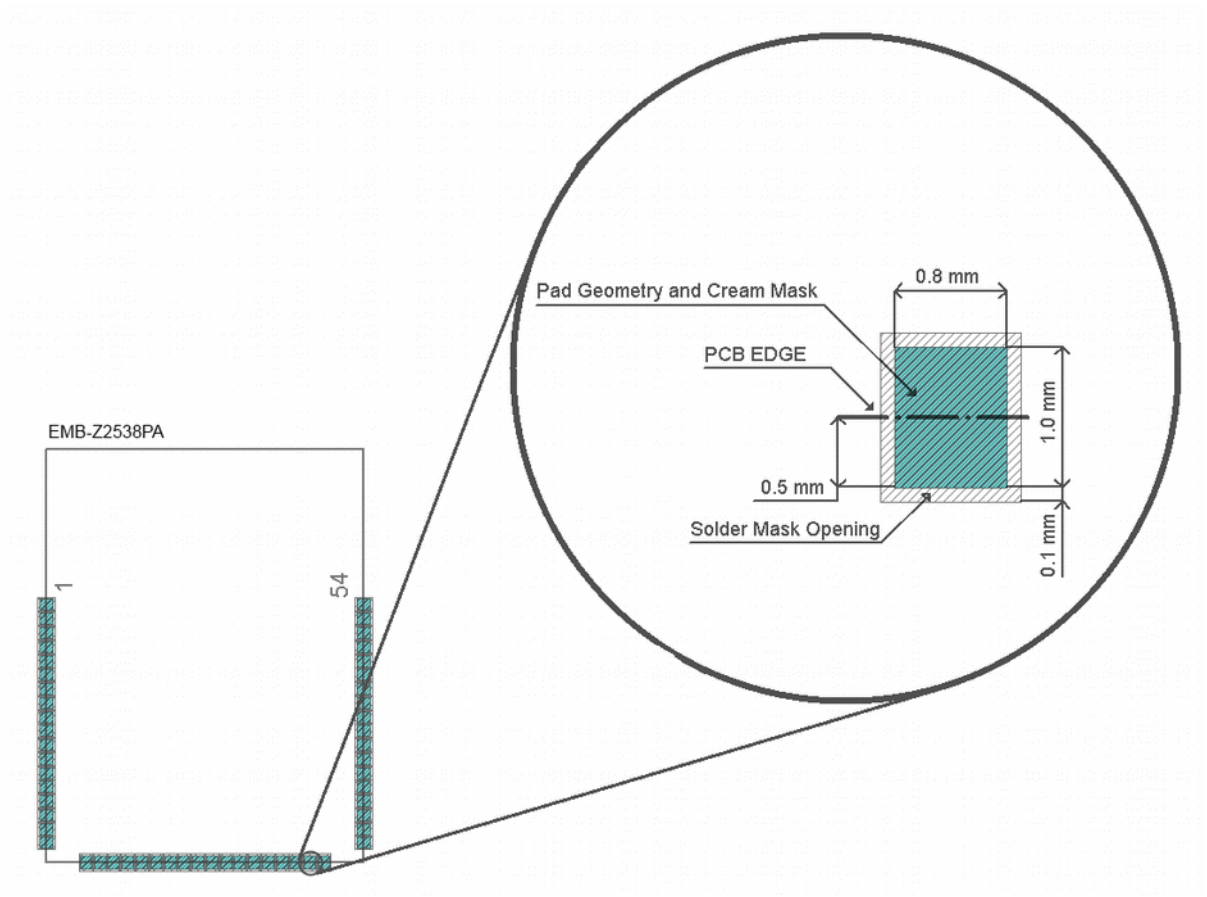



***Image 13**: Details of a pin/pad layout*

## 2.4 Antenna positioning

The module must be installed on a PCB, keeping the area dedicated for the PIFA antenna outside the PCB outline. In the following image is shown an example of installation:

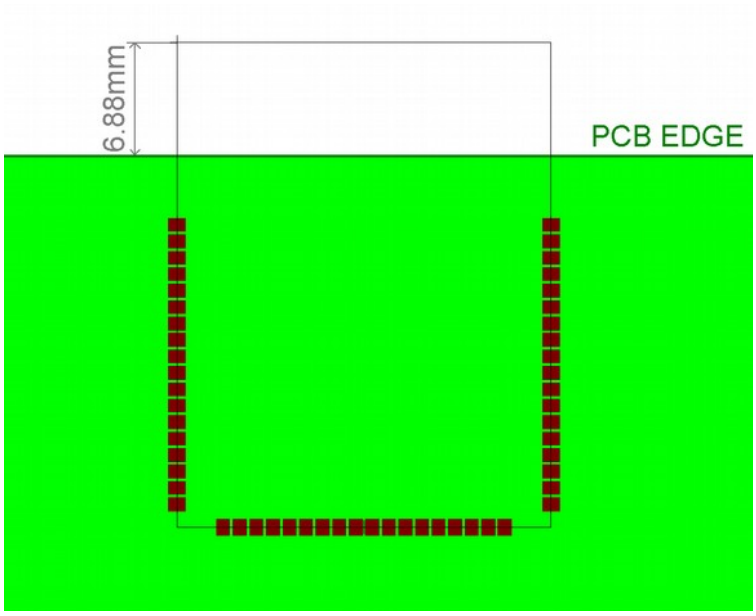



***Image 14**: Antenna positioning*

## 2.5 Notes

- The area underneath the module must be kept free of components (both top and bottom layers) and must be covered with solder resist.
- The PCB top layer underneath the module must be free of nets, power planes and vias. The bottom layer shall provide a ground plane.
- The power supply of the module must be as clean as possible; it must be decoupled placing a ceramic capacitor as near as possible at the Vcc pins, additional filtering made by a ferrite bead is recommended.
- Noisy electronic components (such as switching power supply) must be placed as far as possible and adequately decoupled.
- The ground pins of the module shall be connected to a solid ground plane.
- Keep antenna clear of metal parts of the casing or system.
- Don't use metal enclosures to avoid RF signal degradation.

***Note:*** Taking no account this recommendations may affect the radio performances.

# 3 Connections

## 3.1 Connections overview

The CC2538 microcontroller allows to route on-chip peripheral to external I/Os through a muxing matrix. The internal I/O control module allows these peripheral signals to be routed to or from any of the 32 GPIO pads:

- UART0, UART1
- SSI0 and SSI1
- I2C
- General Purpose Timers 0, 1, 2 and 3

For further information please refer to the Texas Instruments document “CC2538 System-on-Chip Solution for 2.4-GHz IEEE 802.15.4 and ZigBee®/ZigBee IP® Applications” section “General-Purpose Inputs/Outputs”.

## 3.2 Connections Table

| Pin # | Pin Name | Type | Description | IC Pin # |
|---|---|---|---|---|
| 1 | GND | GND | GND | -- |
| 2 | N.C. | Not connected | - | -- |
| 3 | N.C. | Not connected | - | -- |
| 4 | N.C. | Not connected | - | -- |
| 5 | PA7_ADC0 | Analog input or Digital Input/Output | ADC analog input Channel 7 / PA7 | 23 |
| 6 | PA7_ADC0 | Analog input or Digital Input/Output | ADC analog input Channel 7 / PA7 | 23 |
| 7 | N.C. | Not connected | - | -- |
| 8 | N.C. | Not connected | - | -- |
| 9 | N.C. | Not connected | - | -- |
| 10 | N.C. | Not connected | - | -- |
| 11 | N.C. | Not connected | - | -- |
| 12 | N.C. | Not connected | - | -- |
| 13 | PB7_JTAG_TDO | Digital Input/Output | JTAG Data Output | 48 |
| 14 | PB6_JTAG_TDI | Digital Input/Output | JTAG Data Input | 49 |
| 15 | JTAG_TCK | Digital Input/Output | JTAG Clock | 47 |
| 16 | JTAG_TMS | Digital Input/Output | JTAG Mode Select | 46 |
| 17 | N.C. | Not connected | - | -- |
| 18 | VCC | Power Input | Supply voltage | -- |
| 19 | N.C. | Not connected | - | -- |
| 20 | PC7_UART2_RX | Digital Input/Output | UART2 rx data input / PC7 | 6 |
| 21 | PC6_UART2_TX | Digital Input/Output | UART2 tx data output / PC6 | 7 |
| 22 | PA3_UART1_RTS | Digital Input/Output | UART1 request to send input / PA3 | 19 |

| Pin # | Pin Name | Type | Description | IC Pin # |
|---|---|---|---|---|
| 23 | PA2_UART1_CTS | Digital Input/Output | UART1 clear to send output / PA2 | 18 |
| 24 | PA1_UART1_RX | Digital Input/Output | UART1 rx data input / PA1 | 17 |
| 25 | PA0_UART1_TX | Digital Input/Output | UART1 tx data output / PA0 | 16 |
| 26 | N.C. | Not connected | - | -- |
| 27 | N.C. | Not connected | - | -- |
| 28 | N.C. | Not connected | - | -- |
| 29 | N.C. | Not connected | - | -- |
| 30 | PD2_TMR1 | Digital Input/Output | Timer IO signal / PD2 | 27 |
| 31 | PC1_TMR0 | Digital Input/Output | Timer IO signal / PC1 | 13 |
| 32 | PC1_SPI_SCK | Digital Input/Output | SPI Port Clock / PC1 | 13 |
| 33 | PD1_SPI_MOSI | Digital Input/Output | SPI Port MOSI / PD1 | 26 |
| 34 | PD2_SPI_MISO | Digital Input/Output | SPI Port MISO / PD2 | 27 |
| 35 | PC0_SPI_SS | Digital Input/Output | SPI Port Slave Select / PC0 | 14 |
| 36 | N.C. | Not connected | - | -- |
| 37 | VCC | Power Input | Supply voltage | -- |
| 38 | N.C. | Not connected | - | -- |
| 39 | N.C. | Not connected | - | -- |
| 40 | N.C. | Not connected | - | -- |
| 41 | N.C. | Not connected | - | -- |
| 42 | N.C. | Not connected | - | -- |
| 43 | PA4_GPIO | Digital Input/Output | IO (Switch 2) / PA4 | 20 |
| 44 | PA5_GPIO | Digital Input/Output | IO (Switch 1) / PA5 | 21 |
| 45 | N.C. | Not connected | - | -- |
| 46 | N.C. | Not connected | - | -- |
| 47 | PC0_SPI_SS | Digital Input/Output | IO (LED2) / PC0 / SPI SS | 14 |
| 48 | PA6_GPIO | Digital Input/Output | IO (LED1) / PA6 | 22 |
| 49 | X32K_Q2 | Analog input or Digital Input/Output | Optional 32,768KHz crystal oscillator input | 45 |
| 50 | X32K_Q1 | Analog output or Digital Input/Output | Optional 32,768KHz crystal oscillator output | 44 |
| 51 | RESET# | Digital Input | System reset input (active low) | 28 |
| 52 | N.C. | Not connected | - | -- |
| 53 | N.C. | Not connected | - | -- |
| 54 | GND | GND | GND | -- |

# 4 Typical Application Circuit

A basic application circuit for the **EMB-Z2538PA** is shown in Image 15. The **EMB-Z2538PA** allows for a minimal number of external components (thus decreasing system costs).
In Image 15 a LED indicator (LED1) and a push button (SW1) are used to provide a minimal user interface. The JTAG programming/debugging interface, generally speaking, will be routed to a connector on the host board for in-circuit programming.

In addition, a simple supply section (based on a 3.3V LDO stabilizing the input voltage VIN) and a simple reset circuitry are shown. In particular, the reset circuitry of Image 15 allows to

1. program the CC2538 MCU of the **EMB-Z2538PA** (thanks to the weak pull-up to VCC);
2. manually reset the CC2538 MCU, if needed (thanks to SW_RESET).

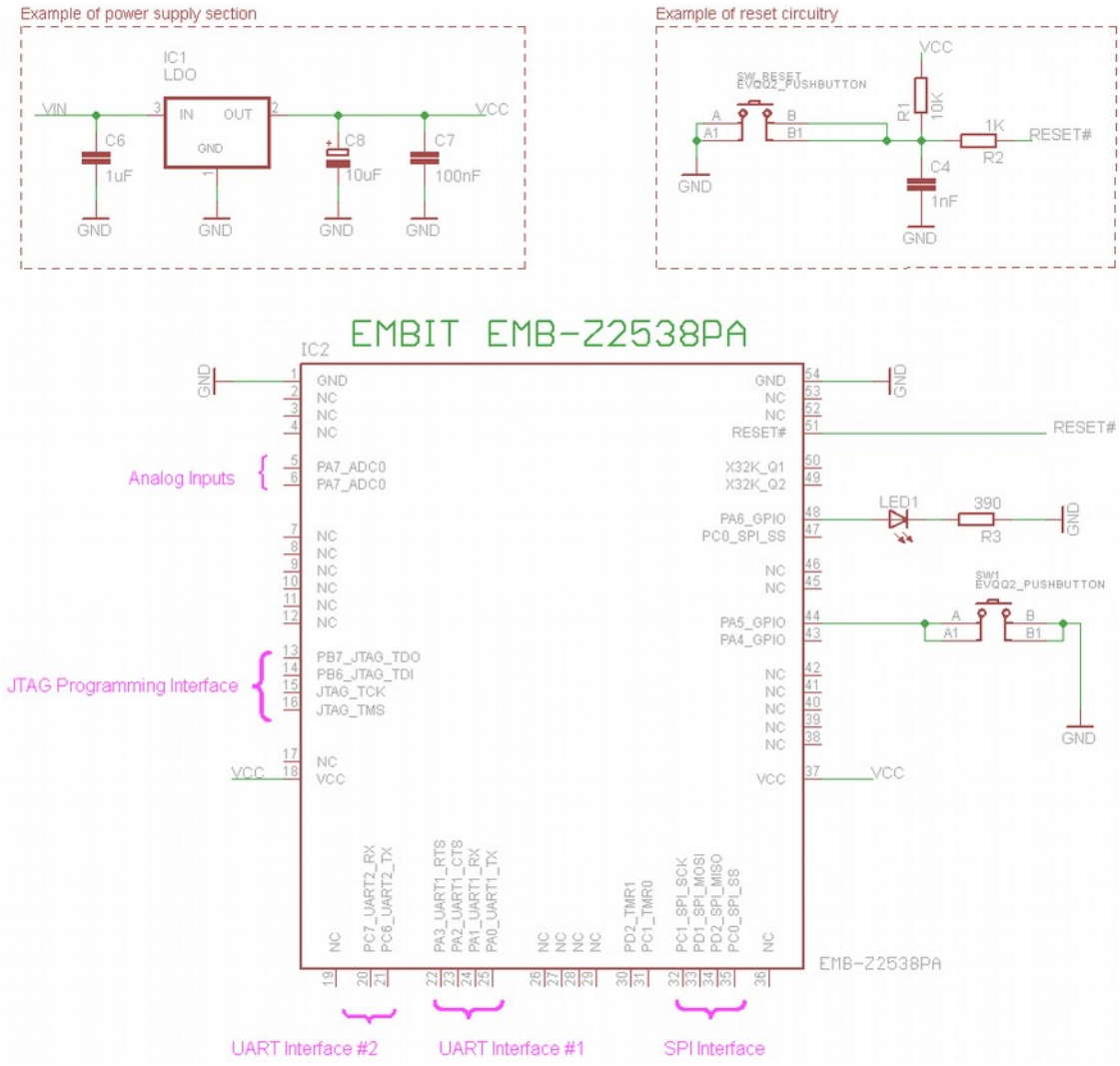



***Image 15**: Typical application circuit for the **EMB-Z2538PA***

# 5 Electrical characteristics

## 5.1 Absolute Maximum Ratings

| | Value | Unit |
|---|---|---|
| Power Supply Voltage | +3.6 | Vdc |
| Voltage on any pin | Vcc + 0.3 (Max 3.6) | Vdc |
| RF input power ($P_{MAX}$) | 10 | dBm |
| Storage Temp. Range | -45 ~ +125 | ℃ |

## 5.2 Operating Conditions

| Parameter | Min | Typ | Max | Unit |
|---|---|---|---|---|
| Power Supply Voltage (Vcc) | 2.1 | 3.3 | 3.6 | Vdc |
| Operating Temperature Range | -40 | | +85 | ℃ |
| Logic Input Low Voltage (@ Vdd = 3 V) | 0 | | 0.5 | Vdc |
| Logic Input High Voltage (@ Vdd = 3 V) | 2.5 | | Vcc | Vdc |
| Logic Output Low Voltage (@ Vdd = 3 V) | 0 | | 0.5 | Vdc |
| Logic Output High Voltage (@ Vdd = 3 V) | 2.4 | | Vcc | Vdc |

## 5.3 Power Consumption

| Mode | Typ. value | Unit |
|---|---|---|
| Tx @ + 20 dBm (MCU core running @ 32 MHz) | 166 | mA |
| Tx @ + 12 dBm (MCU core running @ 32 MHz) | 90 | mA |
| Receive (MCU core running) | 34.5 | mA |
| Idle (MCU core running, radio off) | 15.3 | mA |
| Sleep (MCU core and radio sleeping) | Up to 1.7* | µA |

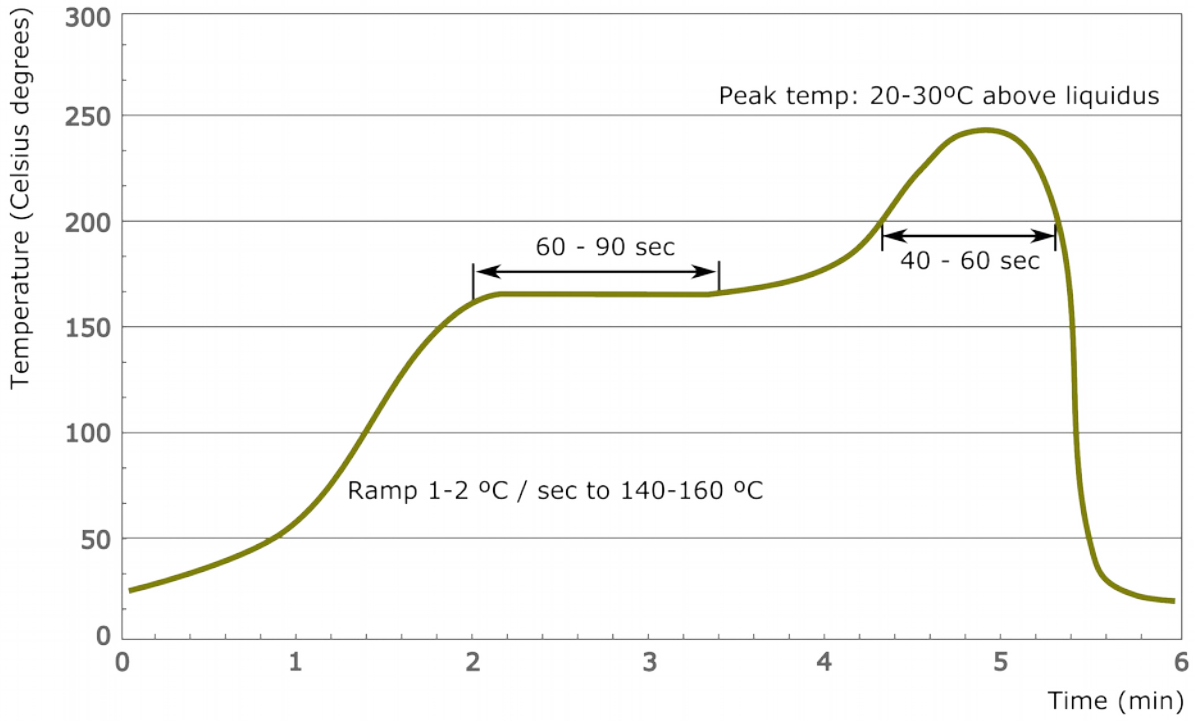
* 1.7 µA can be obtained in power mode with sleep timer running.

## 5.4 RF Characteristic

| Parameter | Min | Typ | Max | Unit |
|---|---|---|---|---|
| RF Frequency Range | 2405 | | 2475 | MHz |
| RF Data Rate | | 250 | | kbps |
| Nominal Output Power | -- | +10 | -- | dBm |
| Programmable Output Power Range | +8 | -- | +22 | dBm |
| Receiver Sensitivity (1% PER) - Normal mode | -- | -99 | -- | dBm |
| Receiver Sensitivity (1% PER) - High sensitivity mode | -- | -101 | -- | dBm |
| Saturation (IP3) - Maximum Input Level | -2 | | | dBm |

# 6 Soldering

**Temperature profile for reflow soldering:**




**Pb-Free Soldering Paste**: it is suggested to used soldering pastes that don't need later clean for residuals.

**Cleaning**: it's not suggested to clean the module. Solder paste residuals underneath the module cannot be removed.

- Water cleaning: the cleaning process using water can involve water entering underneath the module between the two PCBs creating short circuits.
- Alcohol cleaning: the cleaning process with alcohol can damage the module.
- Ultrasound cleaning: the cleaning process with ultrasound can damage the module.

It is suggested to use no clean solder paste to avoid any need for cleaning.

**Cycles:** it is suggested to do only one soldering cycle.

In case of reflow soldering, a drying bake should be done in order to prevent a popcorn effect. Re-baking should be done following IPC standards. Any unused modules that has been open for more than 168 hours or not stored at <10% RH should be baked before any subsequent reflow.

# 7 Regulatory Compliance

## 7.1 Introduction

The purpose of this chapter is to describe which behaviour the user MUST have in order to operate the device under compliance with current regulations. The details described here are then to be read carefully and applied literally. Also, please read carefully all the other documentation available in order to understand all the limits and ensure compliance of the final application.

The module **EMB-Z2538PA** is certified for CE and FCC compliance. The different regulations have different limitations and impose different approaches to the module that will be discussed in different chapters. Any aspect that both the regulations have in common will be described in an appropriate chapter in order to keep readability of this document at maximum.

The main aspect that the user MUST consider is the output power. The module itself is compliant and ready to be used but care must be taken in setting an appropriate output power when programming the devices. The module can output up to 22 dBm of conducted power which translates into up to 20 dBm of EIRP with the integrated antenna or more if using an external antenna. Please follow the directives in this document to set the appropriate output power for the antenna you are using. Any other antenna that is not covered in the certification must not be used unless a new certification is performed.

## 7.2 Compliance: Important information

The module is to be used in accordance with the current guide. Any hardware modification on the module will void the certification.

The use of the module is allowed only with the Embit's modified version of the Texas Instruments software stacks (TIMAC, Z-STACK) on the standard IEEE 802.15.4 channelization (from channel 11 @ 2405 MHz to channel 25 @ 2475 MHz) The channel 26 is not available due to FCC restrictions. Any modification of the software stack is prohibited.

The antennas used must be one of those indicated by the manufacturer and the output power must be set as required by the present document.

The EMB-Z2538PA can operate using the internal PIFA antenna or with an external antenna attached via the U.FL connector. For the specific FCC certification, the list of allowed antenna are indicated in the following table. The use of any other antenna is permitted only with a FCC Class two permissive Change.

There is no duty cycle limit for this module if the appropriate power settings are respected.

The module can only be used with the antennas specified in the following table and the power setting must not exceed those indicated in this table for each antenna and operative area (CE or FCC). If the module is using the integrated antenna, please consider the settings specified for the EMB-AN24-15PFA antenna.

| Antenna code | Antenna type | Antenna gain | Maximum tx power (for CE) | EIRP (for CE) | Maximum tx power (for FCC) | EIRP (for FCC) |
|---|---|---|---|---|---|---|
| EMB-AN24-15PFA | Integrated Printed PCB antenna – PIFA | -2 dBi | +13 dBm | +11 dBm | +22 dBm | +20 dBm |
| EMB-AN24-20SA | Omnidirectional swivel antenna | +2 dBi | +9 dBm | +11 dBm | +22 dBm | +24 dBm |
| EMB-AN24-EA-79F | Omnidirectional swivel antenna | +3 dBi | +8 dBm | +11 dBm | +22 dBm | +25 dBm |
| EMB-AN24-32SA | Omnidirectional swivel antenna | +3.2 dBi | +8 dBm | +11 dBm | +22 dBm | +25 dBm |
| EMB-AN24-50SA_R1 | Omnidirectional swivel antenna | +5 dBi | Not allowed | - | +22 dBm | +27 dBm |
| EMB-AN24-70AN_R1 | Omnidirectional swivel antenna | +7 dBi | Not allowed | - | +22 dBm | +29 dBm |

## 7.3 CE: compliance

The EBM-Z2538PA is in compliance with the essential requirements and other relevant provisions of Directive 1999/5/EC.

The Declaration of Conformity made under Directive 1999/5/EC is available for viewing at the following location in the EU community:

Embit s.r.l.
via Emilia Est, 911
41122 Modena (MO)
Italy

## 7.4 CE: Output power

The CE regulation allows for up to 20 dBm of EIRP output power but imposes a maximum power spectral density of +10 mW/MHz. Considering the bandwidth of the IEEE 802.15.4 and ZigBee, this translates into a reduction of the maximum usable output power. Also spurious emission regulations might impose a lower output power. Consider the antennas table from previous chapter for setting the right output power.

## 7.5 FCC: Data

FCC ID: Z7H-EMB2538PA
Brand: Embit
Model: EMB-Z2538PA
Power supply: 2 to 3.6 VDC

Transmission frequency: 2405 – 2475 MHz
Other certifications: CE

The device complies with part 15 of the FCC Rules. Operation is subjected to the following 2 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.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

This equipment is approved only for mobile and base station transmitting devices, separation distances of (i) 20 centimeters or more for antennas with gains < 6 dBi or (ii) 2 meters or more for antennas with gains ≥ 6 dBi should be maintained between the antenna of this device and nearby persons during operation. To ensure compliance, operation at distances closer than this is not recommended.

## 7.6 FCC: Maximum Output power

The FCC regulation allows for up to 30 dB or output power plus up to 6 dBi of assembly gain which translates into up to +36 dBm of EIRP. The modules EMB-Z2538PA can output up to +22 dBm and so, when using the allowed antennas (maximum +14 dBi Gain), will have no problems with the output power limit. Spurious emission and spectral density doesn't limit the output power neither on the EMB-Z2538PA and so every output power setting can be used.

## 7.7 FCC: Channelization

The IEEE 802.15.4 channel 26 at 2480 MHz is not available due to regulations limitations on the radio spectrum. The Embit firmware stack does not allow to set the channel 26.

# 8 Ordering information

## 8.1 Types

Module variations:

| Part No. | Description |
|---|---|
| EMB-Z2538PA/IA | EMB-Z2538PA integrated PIFA antenna |
| EMB-Z2538PA/UL | EMB-Z2538PA U.FL connector for external antenna |

Related products:

| Part No. | Description |
|---|---|
| EMB-Z2538PA-EVK | EMB-Z2538PA Evaluation Kit |

## 8.2 Packaging

Embit's modules are delivered in tubes, each tube including 20 items.

The tube dimensions are approximately: 508mm x 33mm x 8mm.

# 9 Disclaimer

The user must read carefully all the documentation available before using the product. In particular, care must be taken in order to comply with the regulations (i.e. power limits, duty cycle limits, etc.).

## 9.1 Handling precautions

This product is an ESD sensitive device. Handling precautions should be carefully observed.

## 9.2 Limitations

Every operation involving a modification on the internal components of the module will void the warranty.

## 9.3 Disclaimer of liability

The information provided in this and other documents associated to the product might contain technical inaccuracies as well as typing errors. Regulations might also vary in time. Updates to these documents are performed periodically and the information provided in these manuals might change without notice. The user is required to ensure that the documentation is updated and the information contained is valid. Embit reserves the right to change any of the technical/functional specifications as well as to discontinue manufacture or support of any of its products without any written announcement.

## 9.4 Trademarks

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All other trademarks, registered trademarks and product names are the sole property of their respective owners.