



WE866 HW User Guide

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■ ■ WE866A1-P

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1. INTRODUCTION

1.1. Scope

The aim of this document is the description of some hardware solutions useful for developing a product with the Telit WE866 module.

1.2. Audience

This document is intended for Telit customers, who are integrators, about to implement their applications using our WE866 modules.

1.3. Contact Information, Support

For general contact, technical support services, technical questions and report documentation errors contact Telit Technical Support at:

- TS-EMEA@telit.com
- TS-AMERICAS@telit.com
- TS-APAC@telit.com
- TS-SRD@telit.com

Alternatively, use:

<http://www.telit.com/support>

For detailed information about where you can buy the Telit modules or for recommendations on accessories and components visit:

<http://www.telit.com>

Our aim is to make this guide as helpful as possible. Keep us informed of your comments and suggestions for improvements.

Telit appreciates feedback from the users of our information.

1.4. Text Conventions



Danger – This information **MUST** be followed or catastrophic equipment failure or bodily injury may occur.



Caution or Warning – Alerts the user to important points about integrating the module, if these points are not followed, the module and end user equipment may fail or malfunction.



Tip or Information – Provides advice and suggestions that may be useful when integrating the module.

All dates are in ISO 8601 format, i.e. YYYY-MM-DD.

1.5. [Related Documents](#)

2. OVERVIEW

The aim of this document is the description of some hardware solutions useful for developing a product with the Telit WE866 module. In this document all the basic functions of a mobile phone will be taken into account; for each one of them a proper hardware solution will be suggested and eventually the wrong solutions and common errors to be avoided will be evidenced. Obviously this document cannot embrace the whole hardware solutions and products that may be designed. The wrong solutions to be avoided shall be considered as mandatory, while the suggested hardware configurations shall not be considered mandatory, instead the information given shall be used as a guide and a starting point for properly developing your product with the Telit WE866 module. For further hardware details that may not be explained in this document refer to the Telit WE866 Product Description document where all the hardware information is reported.



NOTE:

(EN) The integration of the WE866 cellular module within user application shall be done according to the design rules described in this manual.

(IT) L'integrazione del modulo cellulare WE866 all'interno dell'applicazione dell'utente dovrà rispettare le indicazioni progettuali descritte in questo manuale.

(DE) Die Integration des WE866 Mobilfunk-Moduls in ein Gerät muß gemäß der in diesem Dokument beschriebenen Konstruktionsregeln erfolgen.

(SL) Integracija WE866 modula v uporabniški aplikaciji bo morala upoštevati projektna navodila, opisana v tem priročniku.

(SP) La utilización del modulo WE866 debe ser conforme a los usos para los cuales ha sido diseñado descritos en este manual del usuario.

(FR) L'intégration du module cellulaire WE866 dans l'application de l'utilisateur sera faite selon les règles de conception décrites dans ce manuel.

(HE) האינטגרציה של מודול ה-WE866 לתוכנת המשתמש תיעשה לפי הכללים המפורטים במסמך זה. אין אחריות על המוצר.

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3. PINS ALLOCATION

3.1. Pin-out

| Pin | Signal | I/O | Function | Type | Comment |
|--|-----------|-----|---|------|------------|
| Asynchronous Serial Port (USIF0) - Prog. / Data + HW Flow Control | | | | | |
| A4 | TXD | I | Serial data input from DTE | | |
| A5 | RXD | O | Serial data output to DTE | | |
| A1 | RTS | I | Input for Request to send signal (RTS) from DTE | | |
| B1 | CTS | O | Output for Clear to Send signal (CTS) to DTE | | |
| Serial Peripheral Interface (SPI) | | | | | |
| A3 | SPI_MISO | O | Module data output Host (Master) data input | | |
| B2 | SPI_MOSI | I | Module data input Host (Master) data output | | |
| A2 | SPI_CLK | I | SPI clock from Host to module | | |
| B3 | SPI_CSN | I | SPI Chip Select (active low) | | Active low |
| Miscellaneous Functions | | | | | |
| D3 | HIB* | I | Hibernate signal input to the module (active low) | | Active low |
| B4 | HOST_INTR | O | Interrupt output (active high) | | |
| G4 | RESET* | I | Reset input for the device (active low) | | Active low |

| | | | | |
|---------------------|----------|-----|--|-------|
| G5 | ON_OFF | I | Input command for power ON | |
| G6 | VDD | O | Supply output for external accessories | |
| G2 | ANT | I/O | WiFi Antenna | RF |
| Power Supply | | | | |
| E1 | VBATT | - | Main Power supply | Power |
| E2 | VBATT | - | Main Power supply | Power |
| C3 | GND | - | Ground | Power |
| D1 | GND | - | Ground | Power |
| D2 | GND | - | Ground | Power |
| E3 | GND | - | Ground | Power |
| F1 | GND | - | Ground | Power |
| F2 | GND | - | Ground | Power |
| F3 | GND | - | Ground | Power |
| G1 | GND | - | Ground | Power |
| G3 | GND | - | Ground | Power |
| F6 | GND | - | Ground | Power |
| Reserved | | | | |
| C1 | RESERVED | | RESERVED | |
| C2 | RESERVED | | RESERVED | |
| C4 | RESERVED | | RESERVED | |

| | | |
|-----------|----------|----------|
| D4 | RESERVED | RESERVED |
| E4 | RESERVED | RESERVED |
| F4 | RESERVED | RESERVED |
| B5 | RESERVED | RESERVED |
| C5 | RESERVED | RESERVED |
| D5 | RESERVED | RESERVED |
| E5 | RESERVED | RESERVED |
| F5 | RESERVED | RESERVED |
| A6 | RESERVED | RESERVED |
| B6 | RESERVED | RESERVED |
| C6 | RESERVED | RESERVED |
| D6 | RESERVED | RESERVED |
| E6 | RESERVED | RESERVED |
| A7 | RESERVED | RESERVED |
| B7 | RESERVED | RESERVED |
| C7 | RESERVED | RESERVED |
| D7 | RESERVED | RESERVED |
| E7 | RESERVED | RESERVED |
| F7 | RESERVED | RESERVED |
| G7 | RESERVED | RESERVED |



Warning – Reserved pins must not be connected.



Warning – VDD output must not be used to supply any device on the customer application.

It is only provided as reference/supply voltage when voltage translation to 1V8 CMOS is needed.

When its use is necessary, it is strongly recommended to connect VAUX through a series resistor as closed as possible to the module in order to reduce the inrush current of the internal DC/DC supply. Use a low value resistor (e.g. 10 ohm, 1/3W) with a maximum power rating to drained current.

3.2. LGA Pads Layout

TOP VIEW

| | A | B | C | D | E | F | G |
|---|----------|-----------|-----|------|-------|-----|--------|
| 1 | RTS | CTS | RES | GND | VBATT | GND | GND |
| 2 | SPI_CLK | SPI_MOSI | RES | GND | VBATT | GND | ANT |
| 3 | SPI_MISO | SPI_CS | GND | nHIB | GND | GND | GND |
| 4 | TXD | HOST_INTR | RES | RES | RES | RES | RESET* |
| 5 | RXD | RES | RES | RES | RES | RES | ON_OFF |
| 6 | RES | RES | RES | RES | RES | GND | VDD |
| 7 | RES | RES | RES | RES | RES | RES | RES |

4. POWER SUPPLY

4.1. Power Supply Requirements

The external power supply must be connected to VBATT signals and must fulfill the following requirements:

| Power Supply | |
|--------------------------------|---------------|
| Nominal Supply Voltage | 3.8 V |
| Normal Operating Voltage Range | 3.1 V÷ 4.50 V |



The Operating Voltage Range **MUST** never be exceeded; care must be taken when designing the application's power supply section to avoid having an excessive voltage drop.

If the voltage drop is exceeding the limits it could cause a Power Off of the module.



Please note that the operating voltage limits **MUST** never be exceed, including voltage overshoots and drops.

4.2. Power Consumption

The WE866 expected power consumption is reported on the table below. All values are at 25°C and VBATT=3.8V, if not otherwise stated.

| Functional mode | | Current consumption(*) (typ) [mA] |
|--|-----------------|---|
| Transmission at maximum power level | 802.11b, 1Mbps | 285 |
| | 802.11g, 6Mbps | 261 |
| | 802.11g, 54Mbps | 236 |
| Reception | 802.11b, 1Mbps | 66 |
| | 802.11g, 54Mbps | 66 |
| Idle connected | | 14 |
| Peak calibration | | <400 |
| Hibernate | | 0.03 |

(*) preliminary values

4.3. General Design Rules

The principal guidelines for the Power Supply Design embrace three different design steps:

- The electrical design
- The thermal design
- Thermal PCB layout

4.3.1. Electrical Design Guidelines

The electrical design of the power supply depends strongly on the power source from which this power is drained. We will distinguish them into three categories:

- +5V input (typically PC internal regulator output)
- +12V input (typically automotive)
- Battery

4.3.1.1. +5V Source Power Supply Design Guidelines

- Because of the small difference between the input and output voltage, a switching converter is not the best choice, therefore a low-dropout regulator is required.
- When using a linear regulator, a proper heat sink must be provided in order to dissipate the power generated.
- A low-ESR, bypass capacitor of adequate capacity must be provided in order to cut the current absorption peaks close to the WE866, a 100 μ F tantalum capacitor is usually suited.
- Make sure the low ESR capacitor on the power supply output (usually a tantalum one) is rated at least 10V.
- A protection diode should be inserted close to the power input, in order to save the WE866 from power polarity inversion.

4.3.1.2. +12V Source Power Supply Design Guidelines

- In this case, better efficiency of switching regulators can be exploited to generate the required 3.8V
- Switching frequencies of 500kHz or above are preferable, because of the smaller inductor size and the faster transient response.
- For car Pb battery, the input voltage can rise up to 15.8V and this should be kept in mind when choosing components: all components in the power supply must withstand this voltage. A spike protection diode has to be inserted close to the power input.
- A low-ESR, bypass capacitor of adequate capacity must be provided in order to cut current absorption peaks. 100 μ F, 10V is usually enough.
- A protection diode should be inserted close to the power input, to avoid damage to the WE866 from polarity inversion. This can be the same diode used for spike protection.

4.3.1.3. Battery Source Power Supply Design Guidelines

- A single 3.7V Li-Ion cell battery can be used to power the WE866 module.
- A low-ESR, bypass capacitor of adequate capacity must be provided in order to cut current absorption peaks. 100 μ F, 10V is usually enough.
- The WE866 module must be protected from polarity inversion: this can be done with a protection diode, or by exploiting a suitable battery connector



Both three-cell Ni/Cd or Ni/MH 3.6V batteries, and 4V Pb batteries, can feature maximum voltages above the maximum allowed VBATT for the WE866, which is 4.5V. For this reason, they must not be directly connected to the module. Only Li-Ion types are recommended for direct connection.

4.3.2. Power Supply PCB layout Guidelines

As seen on the electrical design guidelines, the power supply shall have a low-ESR capacitor on its output, to cut the current peaks, and a protection diode on its input, to protect the VBATT pins from polarity inversion. The placement of these components is crucial to ensure the correct working of the circuitry. A misplaced component can be useless, or even detrimental to the power supply performances.

- The low-ESR, bypass capacitor must be placed close to the WE866 VBATT pads, or close to the inductor if a switching regulator is used.
- The protection diode must be placed close to the input power connector.
- The pcb power traces must be wide enough to ensure negligible voltage drop even at the highest rated current consumption for the WE866.
- Use of a good, common ground plane is recommended.

4.4. VDD Power Output

A regulated 1.85V supply voltage is provided on pin G6 of the WE866 module. Please note that this voltage has the sole purpose to be a reference, e.g. for external voltage translators. No external devices must be powered from this voltage.

5. DIGITAL SECTION

5.1. Logic Levels

The following table shows the logic level specifications use in WE866:

| Parameter | Min | Max |
|--|-------|-------|
| Input level on any digital pin (CMOS 1.8V) when on | -0.3V | +2.1V |

| Level | Min | Max |
|---|------|------|
| V_{IH} Input high level | 1.5V | 2.1V |
| V_{IL} Input low level | 0V | 0.4V |
| V_{OH} Output high level | 1.6V | 2.1V |
| V_{OL} Output low level | 0V | 0.2V |
| V_{IL} nRESET | 0V | 0.6V |

The nRESET pin must be held below 0.6V for the device to register a reset.

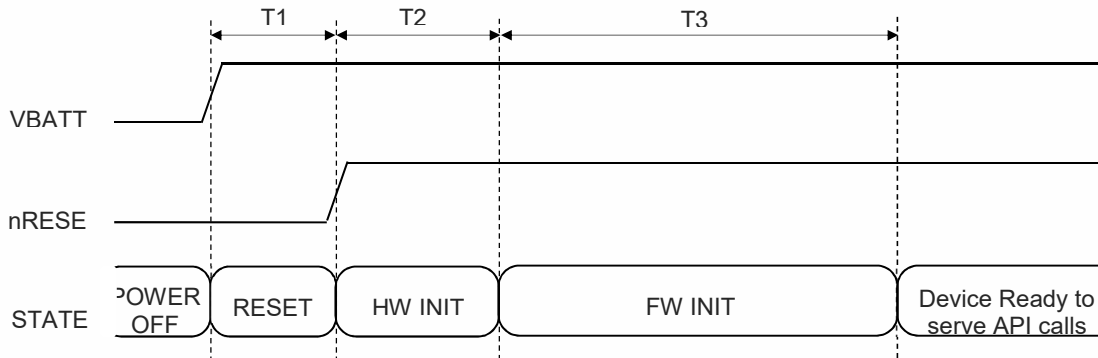
| Level | Typical |
|----------------|---------|
| Input current | 5nA |
| Output current | 6mA |

5.2. Power On

The module is usually in state on mode. ON_OFF line is internally pulled up and when VBATT is applied the module is automatically turned on.

The device need 3 ms to switch on the device and have all the internally voltage stable, this soft start prevents excessive voltage drops of primary cells and rechargeable batteries with high internal impedance. nRESET must be held low until the VBATT supply to the device is driven and stable.

In order to switch on the device it must be applied a input logic high level to ON_OFF pin.



| ITEM | NAME | DESCRIPTION | TYPICAL |
|------|----------------------|--|---------|
| T1 | Supply settling time | | 3ms |
| T2 | Hardware wake-up | | 25ms |
| T3 | Initialization time | Internal XTAL stabilization plus firmware initialization time plus radio calibration | 1.35s |



Tip or Information – Don't use any pull up resistor on the ON_OFF line, it is internally pulled up.

5.3. Power Off

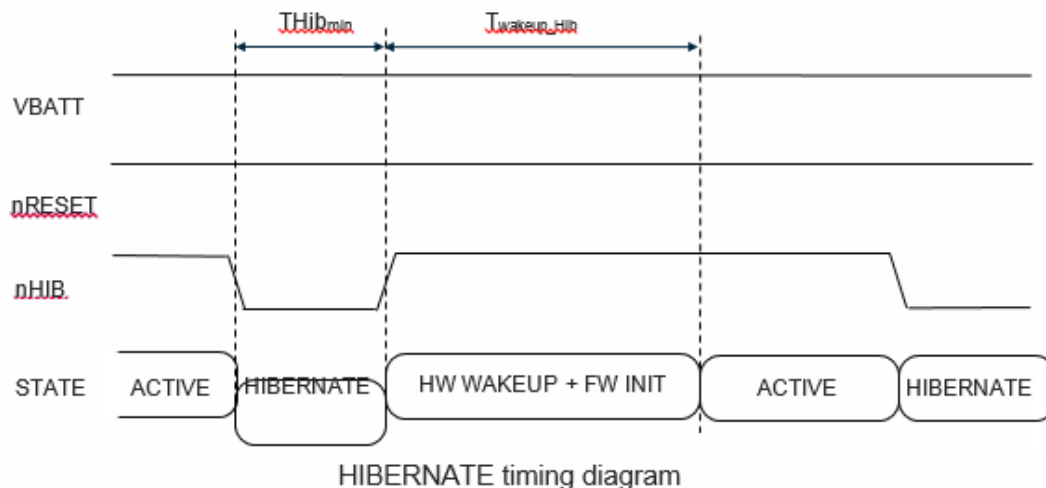
In order to switch off the device it's necessary to force the ON_OFF pin to 0V.

5.4. Low power deep sleep

The low power deep sleep (LPDS) mode is an energy-efficient and transparent sleep mode that is entered automatically during periods of inactivity based on internal power optimization algorithms. The device can wake up in less than 3ms from the internal timer or from any incoming host command. Typical battery drain in this mode is 115 μ A. During LPDS mode, the device retains the software state and certain configuration information. The operation is transparent to the external host; thus, no additional handshake is required to enter or exit this sleep mode.

5.5. Hibernate

The hibernate mode is the lowest power mode in which all of digital logic is power-gated. Only a small section of the logic powered directly by the main input supply is retained. The RTC is kept running and the device wakes up once the nHIB line is asserted by the host device. Ultralow leakage when disabled (hibernate mode) with a current of less than 4 μ A with the RTC running. The average wake-up time is longer than LPDS mode, is about 50ms.



| ITEM | NAME | DESCRIPTION | MIN | TYP | MAX |
|-------------------|--|---------------------------------------|------|------|-----|
| T_{hib_min} | Minimum hibernate time | Minimum pulse width of nHIB being low | 10ms | | |
| T_{wakeup_hib} | Hardware wakeup time plus firmware initialization time | (1) | | 50ms | |

(1) If temperature changes by more than 20°C, initialization time from HIB can increase by 200ms due to radio calibration.

5.6. Shutdown

The shutdown mode is the lowest power-mode system-wise. All device logics are off, including the real-time clock (RTC). The wake-up time in this mode is longer than hibernate, is about 1.1s.

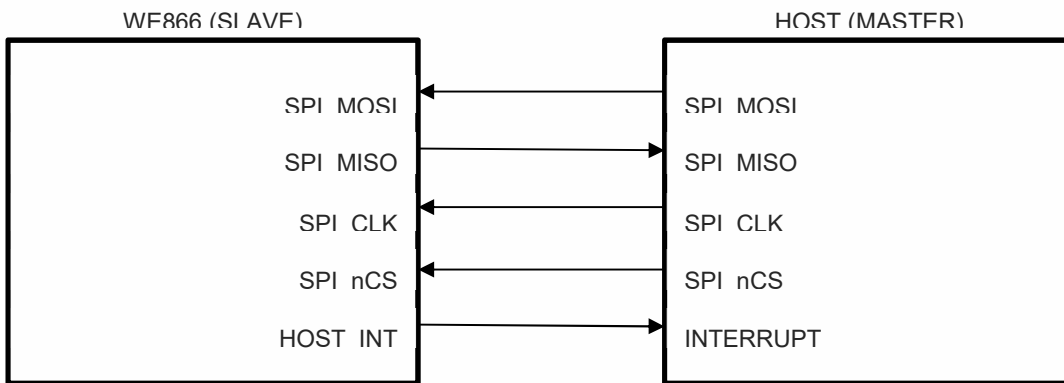
| State | Wake-up Time | Average Power Consumption |
|------------------------------------|--------------|---------------------------|
| Low Power Deep Sleep (LPDS) | 3ms | 115µA |
| Hibernate | 50ms | 4µA |
| Shutdown | 1.1s | 1µA |

5.7. Communication ports

5.7.1. SPI

Module WE866 is considered as a slave when it is interfaced with a Host which acts as master. In addition to the standard SPI lines (MOSI, MISO, CLK, CS) it can be used also HOST_INT line. WE866 can interrupt the host using HOST_INT line to initiate the data transfer over the interface. The SPI interface can work up to a speed of 20MHz.

| PAD | Signal | I/O | Function |
|-----------|----------|-----|--|
| B2 | SPI_MOSI | I | Module data input, Host data output |
| A3 | SPI_MISO | O | Module data output, Host data input |
| A2 | SPI_CLK | I | SPI clock from Host to module |
| B3 | SPI_nCS | I | SPI Chip select (active low) from Host |
| B4 | HOST_INT | O | Interrupt from Module to Host (Optional) |



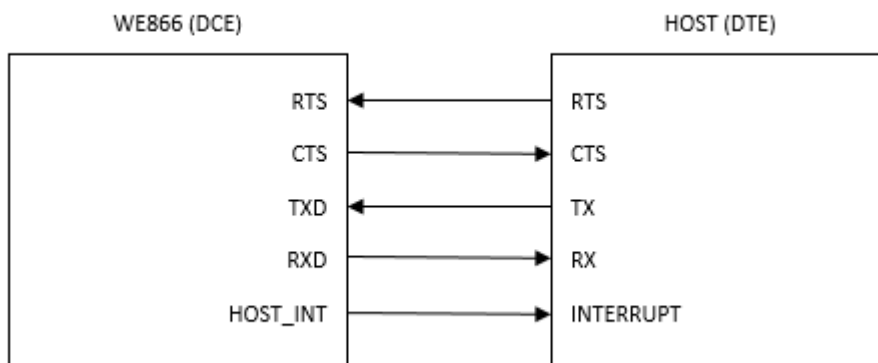
5.7.2. UART

In the table below are listed the UART configuration of WE866.

| PROPERTY | WE866 CONFIGURATION |
|--------------------------------|--|
| Baud rate | 115200 bps, no auto-baud rate detection, can be changed by the host up to 3 Mbps using a special command |
| Data bits | 8 bits |
| Flow control | CTS/RTS |
| Parity | None |
| Stop bits | 1 |
| Bit order | LSBit first |
| Host interrupt polarity | Active high |
| Host interrupt mode | Rising edge or level 1 |
| Endianness | Little-endian only, WE866 does not support automatic detection of the host length while using the UART interface |

| PAD | Signal | I/O | Function |
|-----------|----------|-----|---|
| A1 | RTS | I | Input for Request to send signal (RTS) from DTE |
| B1 | CTS | O | Output for Clear to send signal (CTS) to DTE |
| A4 | TXD | I | Serial data input (TXD) from DTE |
| A5 | RXD | O | Serial data output (RXD) to DTE |
| B4 | HOST_INT | O | Interrupt from Module to Host (Optional) |

Figure.. shows the typical UART topology comprised of four standard UART lines (RTS, CTS, TX and RX) plus an optional line INTERRUPT from WE866 module to the host controller to allow efficient low-power mode. The configuration with INTERRUPT line offers the maximum communication reliability and flexibility between the host and the module.



6. RF SECTION

6.1. Bands Variants

The WE866 module operates in the 2.400-2.500 GHz ISM band, and it complies with protocols 802.11b/g/n. Supported channels are 1-13, at frequencies listed in the following table:

| Channel | Frequency [MHz] |
|---------|-----------------|
| 1 | 2412 |
| 2 | 2417 |
| 3 | 2422 |
| 4 | 2427 |
| 5 | 2432 |
| 6 | 2437 |
| 7 | 2442 |
| 8 | 2447 |
| 9 | 2452 |
| 10 | 2457 |
| 11 | 2462 |
| 12 | 2467 |
| 13 | 2472 |



Please note that channel availability may vary according to regional regulations.

6.2. TX Output power

All measures have been taken at VBATT = 3.8V, Tamb = 25°C, if not otherwise stated.

| Protocol | Datarate [Mbps] | Maximum RMS output power (typ.) (*) [dBm] |
|----------------|--------------------|---|
| 802.11b | 1 | 17 |
| | 2 | 17 |
| | 11 | 17.25 |
| 802.11g | 6 | 16.25 |
| | 9 | 16.25 |
| | 54 | 13.5 |
| 802.11n | MCS7 | 12.0 |

(*) preliminary values



Please note that maximum allowed output power may depend on regional regulations.

6.3. RX Sensitivity

All measures have been taken at VBATT = 3.8V, Tamb = 25°C, if not otherwise stated.

| Protocol | Datarate [Mbps] | Sensitivity (typ.)(*) [dBm] |
|----------------------------------|--------------------|---------------------------------|
| 802.11b (PER < 8%) | 1 | -94.7 |
| | 2 | -92.6 |
| | 11 | -87.0 |
| 802.11g (PER < 10%) | 6 | -89.0 |
| | 9 | -88.0 |
| | 54 | -73.0 |
| 802.11n (PER < 10%) ¹ | MCS0 | -88.0 |
| | MCS7 | -70.0 |
| | MCS7 (mixed mode) | -69.0 |

(*) preliminary values

6.4. Antenna requirements

Special care must be taken during the design of the RF section on the application board.



RF performance degradation, and infringements of emission limits, may arise if the following recommendations are not respected.

A 50 Ω antenna is required. Telit's WE866 interface features an SMA connector for an external antenna, but other choices are possible, such as a chip or a printed one. In case an integrated or printed antenna is used, it is recommended to place it on the edge of the application board.

Since it may be necessary to tune the antenna impedance to 50 Ω , it is recommended to foresee a PI matching network between the WE866 and the antenna, at least during first prototyping: if not required, a series 0 Ω -resistor can be used, leaving the two shunt components unpopulated.

In order to be able to reuse Telit's FCC certification, the antenna on the application board shall have a gain equal to the one recommended by Telit, or lower.

6.4.1. PCB Design guidelines

The WE866 module provides a 50 Ω antenna pad, which has to be routed to the antenna connector (or the integrated antenna) by means of a transmission line.

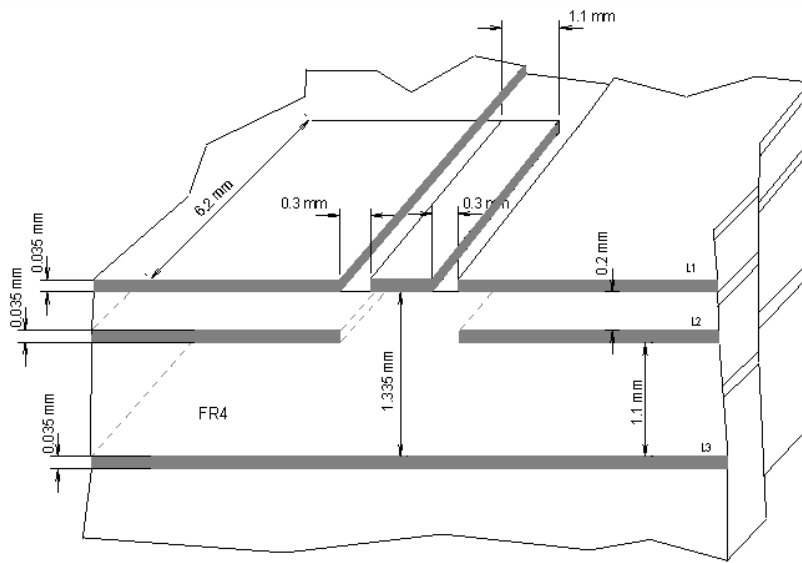
It is vital that the impedance of this line is controlled to 50 Ω . The line should be as short as possible, and keep a constant cross section, without abrupt curves. It shall be isolated from any other noise source: in particular, trace shall not be crossed by other lines in adjacent layers. Instead, a continuous ground plane is recommended under the antenna trace, and a ground via curtain should connect it to the coplanar ground planes.

As an example of a possible implementation, the details of the antenna trace on the WE866 interface board are described in this section.

A Grounded Coplanar Waveguide (G-CPW) line has been chosen, since this kind of transmission line ensures good impedance control and can be implemented in an outer PCB layer as needed in this case. A SMA female connector has been used to feed the line.

The interface board is realized on a FR4, 4-layers PCB. Substrate material is characterized by relative permittivity $\epsilon_r = 4.6 \pm 0.4 @ 1 \text{ GHz}$, $\text{TanD} = 0.019 \div 0.026 @ 1 \text{ GHz}$.

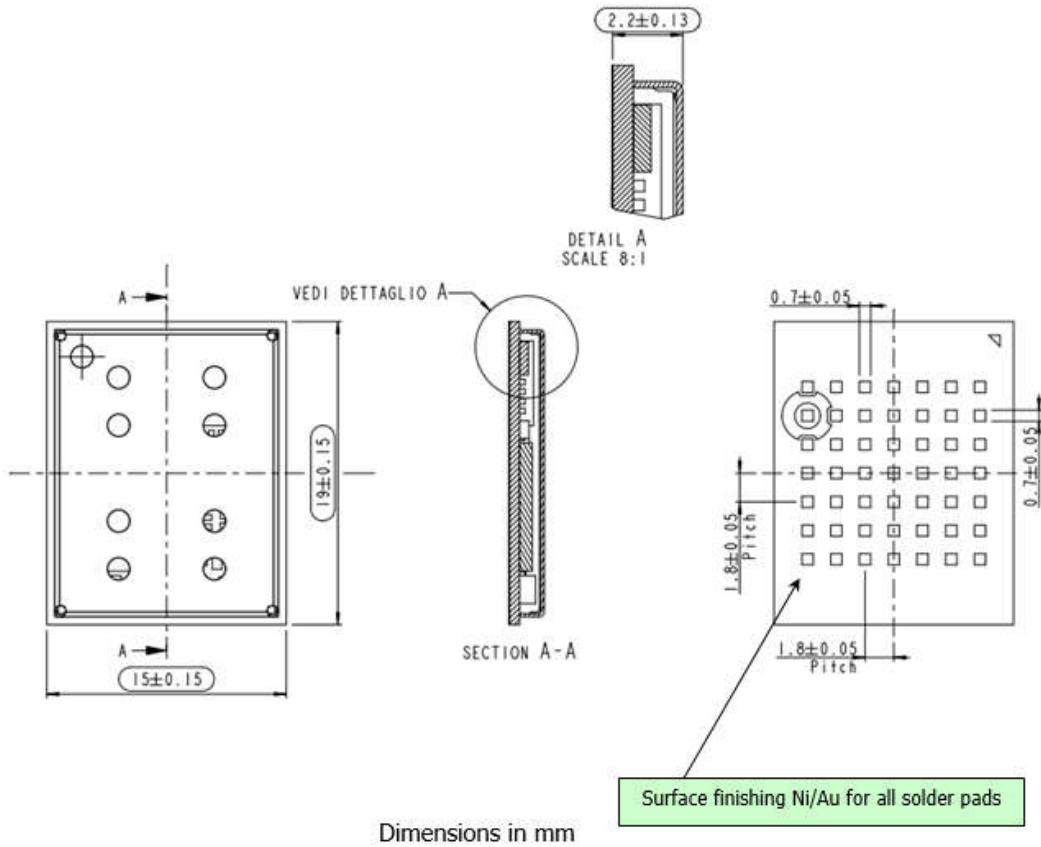
A characteristic impedance of nearly 50 Ω is achieved using trace width of 1.1 mm, clearance from coplanar ground plane = 0.3 mm each side. The line uses reference ground plane on layer 3, while copper is removed from layer 2 underneath the line. Height of trace above ground plane is 1.335 mm. Calculated characteristic impedance is 51.6 Ω , estimated line loss is less than 0.1 dB. The line geometry is shown below:



6.4.2. PCB Guidelines in case of FCC Certification

7. MECHANICAL DESIGN

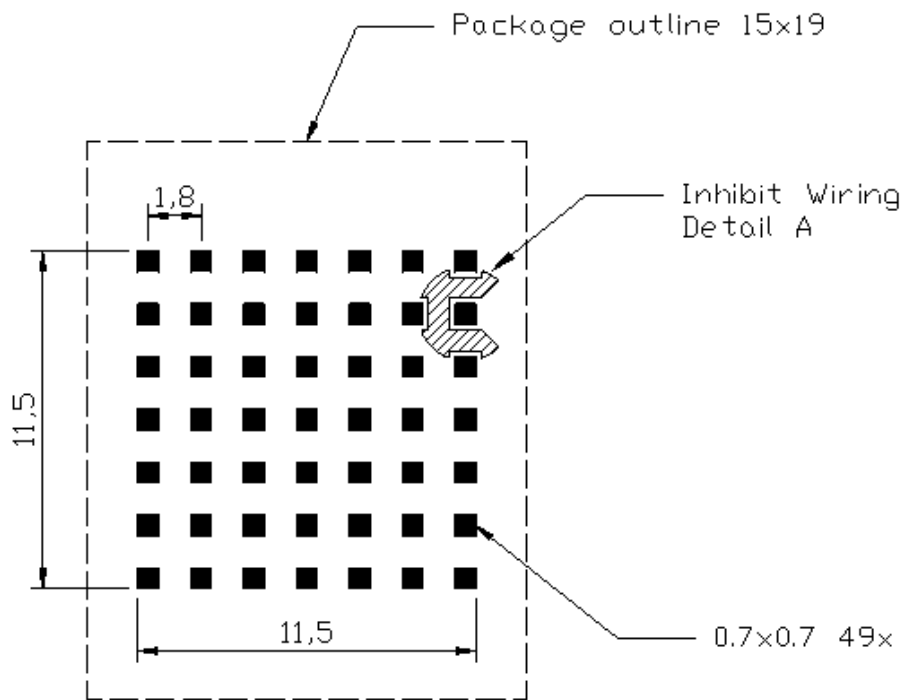
7.1. Drawing



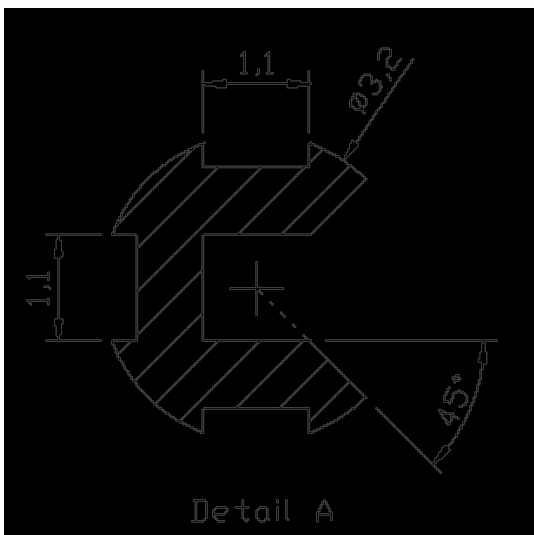
8. APPLICATION PCB DESIGN

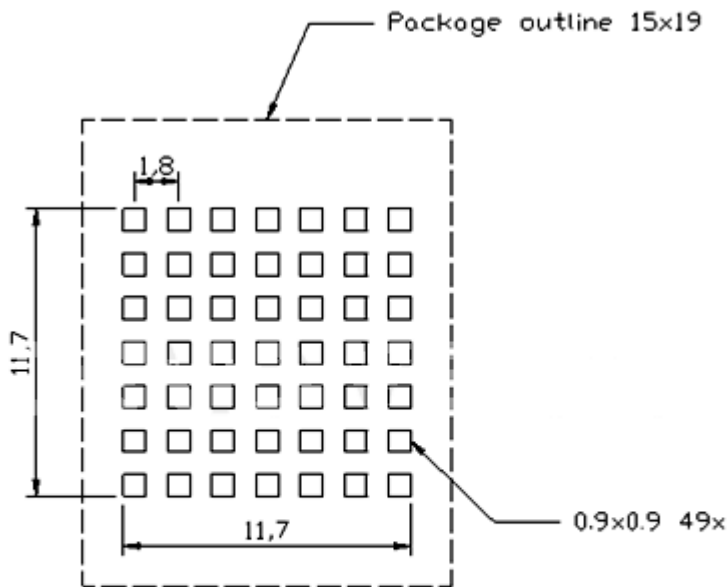
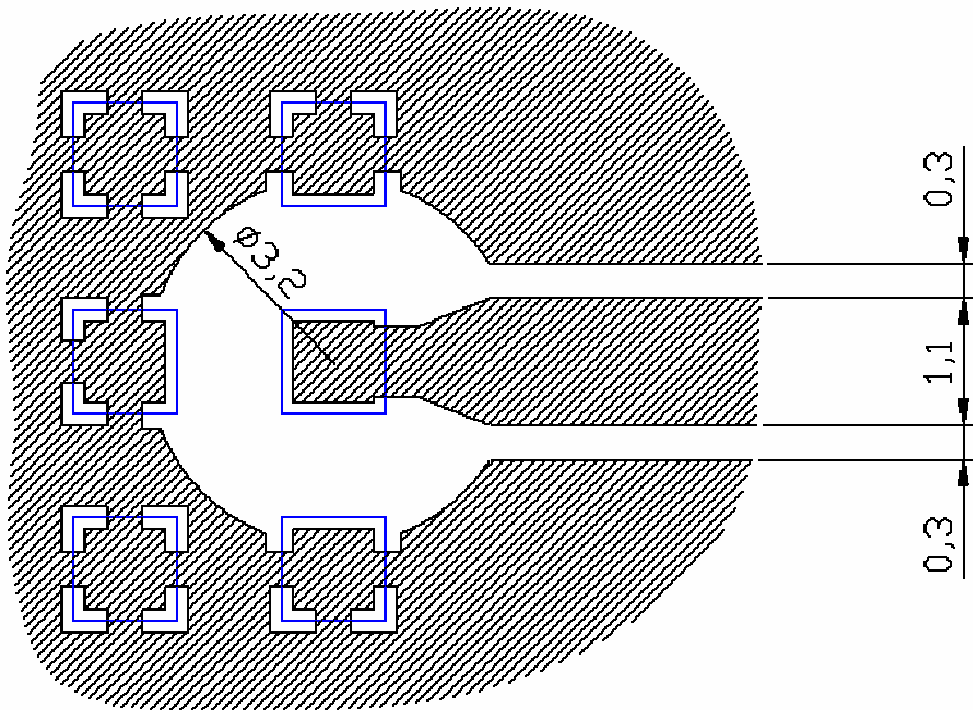
8.1. Footprint

Recommended footprint for the application:



Copper pad pattern
Top view





Solder resist pattern
Top view

In order to easily rework the WE866 is suggested to consider on the application a 1.5 mm placement inhibit area around the module.

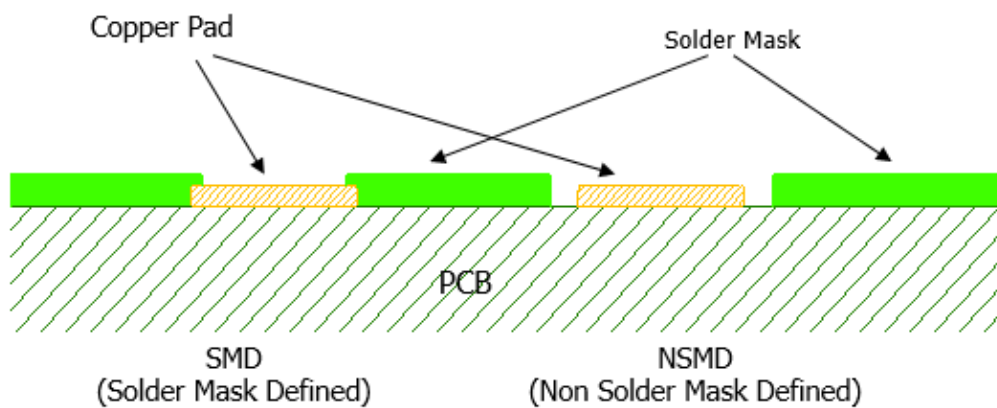
It is also suggested, as common rule for an SMT component, to avoid having a mechanical parts of the application in direct contact with the module.



Tip or Information – In the customer application, the region under WIRING INHIBIT (see figure above) must be clear from signal or ground paths.

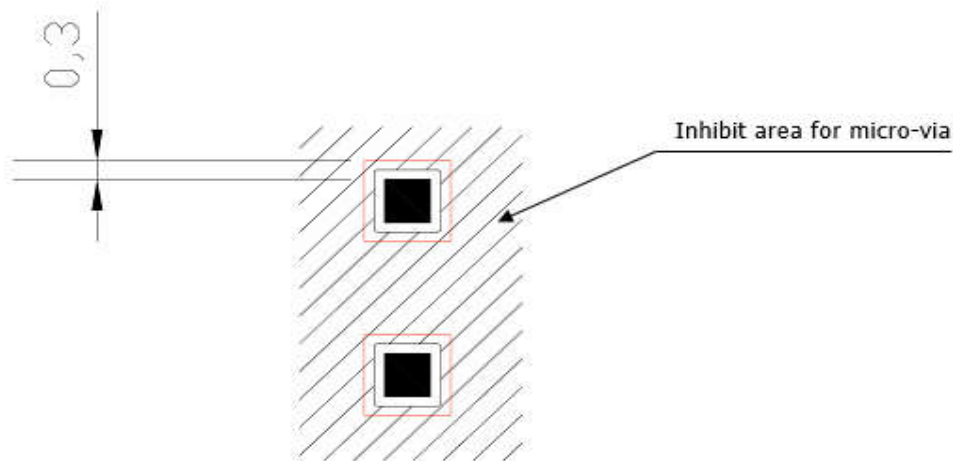
8.2. PCB pad design

Non solder mask defined (NSMD) type is recommended for the solder pads on the PCB.



8.3. PCB pad dimensions

It is not recommended to place via or micro-via not covered by solder resist in an area of 0.3 mm around the pads unless it carries the same signal of the pad itself (see following figure).



Holes in pad are allowed only for blind holes and not for through holes.

Recommendations for PCB pad surfaces:

| Finish | Layer thickness [μm] | Properties |
|---|-----------------------------------|---|
| Electro-less Ni / Immersion Au | 3 – 7 / 0.03 – 0.15 | Good solderability protection, high shear force values |

The PCB must be able to resist the higher temperatures which are occurring at the lead-free process. This issue should be discussed with the PCB-supplier. Generally, the wettability of tin-lead solder paste on the described surface plating is better compared to lead-free solder paste.

It is not necessary to panel the application PCB, however in that case it is suggested to use milled contours and predrilled board breakouts; scoring or v-cut solutions are not recommended.

8.4. Stencil

Stencil's apertures layout can be the same of the recommended footprint (1:1), we suggest a thickness of stencil foil $\geq 120 \mu\text{m}$.

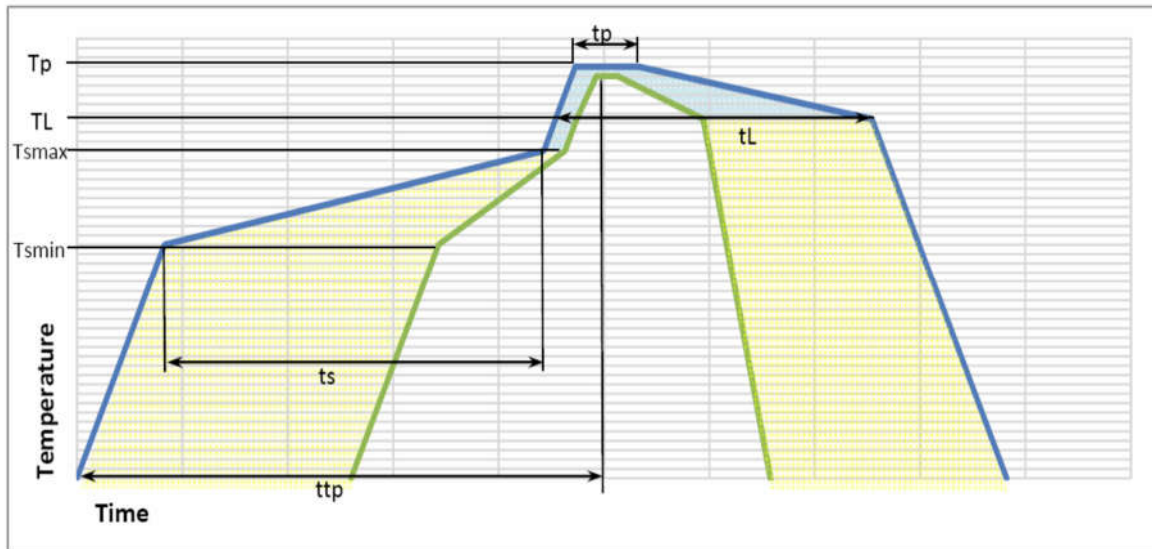
8.5. Solder paste

| | |
|--------------|-----------|
| | Lead free |
| Solder paste | Sn/Ag/Cu |

We recommend using only “no clean” solder paste in order to avoid the cleaning of the modules after assembly.

8.6. Solder Reflow

Recommended solder reflow profile



| Profile Feature | Pb-Free Assembly |
|--|------------------|
| Average ramp-up rate (TL to TP) | 3°C/second max |
| Preheat | |
| – Temperature Min (Tsmmin) | 150°C |
| – Temperature Max (Tsmmax) | 200°C |
| – Time (min to max) (ts) | 60-180 seconds |
| Tsmmax to TL | |
| – Ramp-up Rate | 3°C/second max |
| Time maintained above: | |

| | |
|--|-----------------|
| - Temperature (TL) | 217°C |
| - Time (tL) | 60-150 seconds |
| Peak Temperature (Tp) | 245 +0/-5°C |
| Time within 5°C of actual Peak Temperature (tp) | 10-30 seconds |
| Ramp-down Rate | 6°C/second max. |
| Time 25°C to Peak Temperature | 8 minutes max. |



Tip or Information – All temperatures refer to topside of the package, measured on the package body surface.

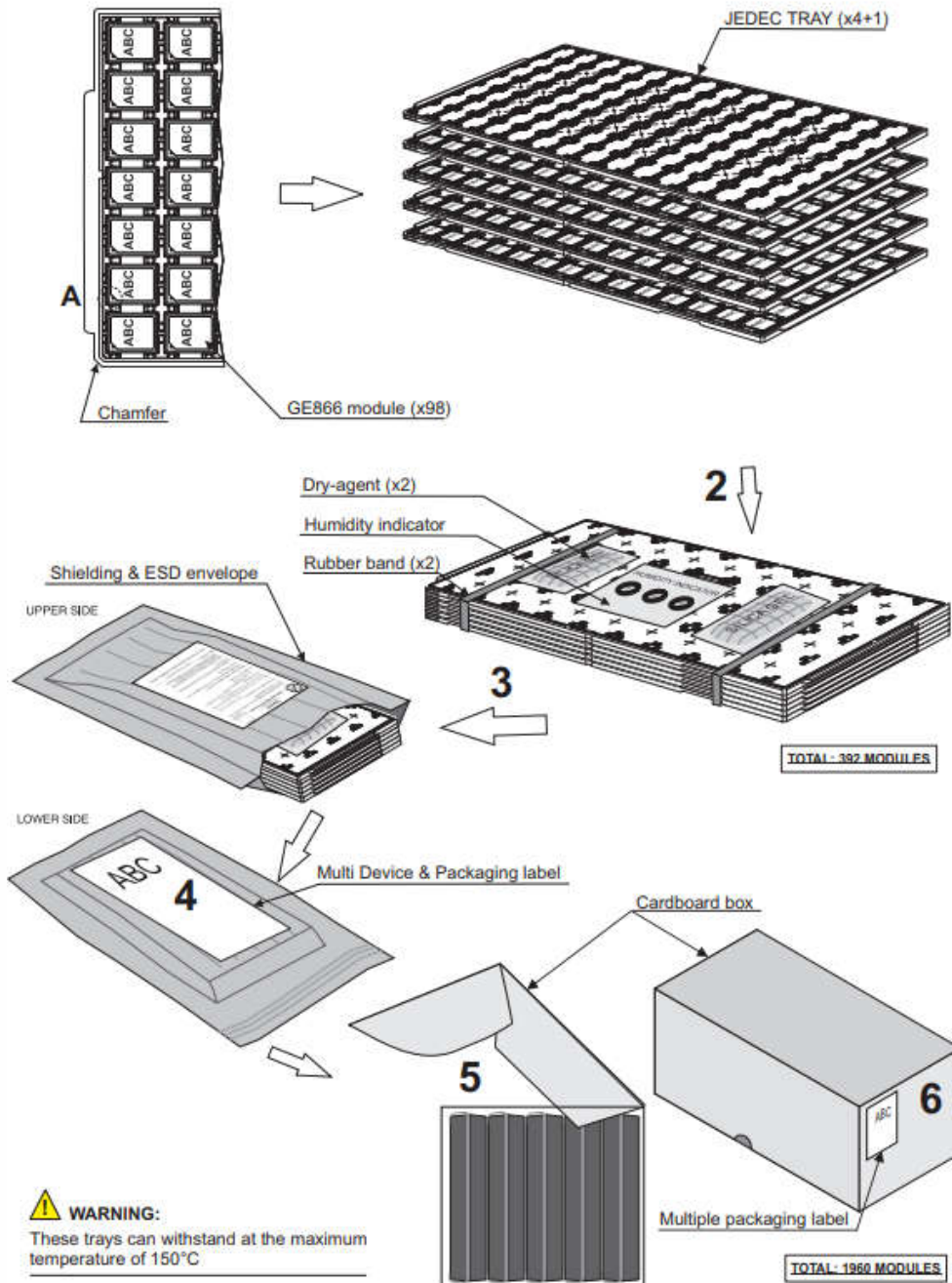


Caution or Warning –WE866 module withstands one reflow process only.

9. PACKAGING

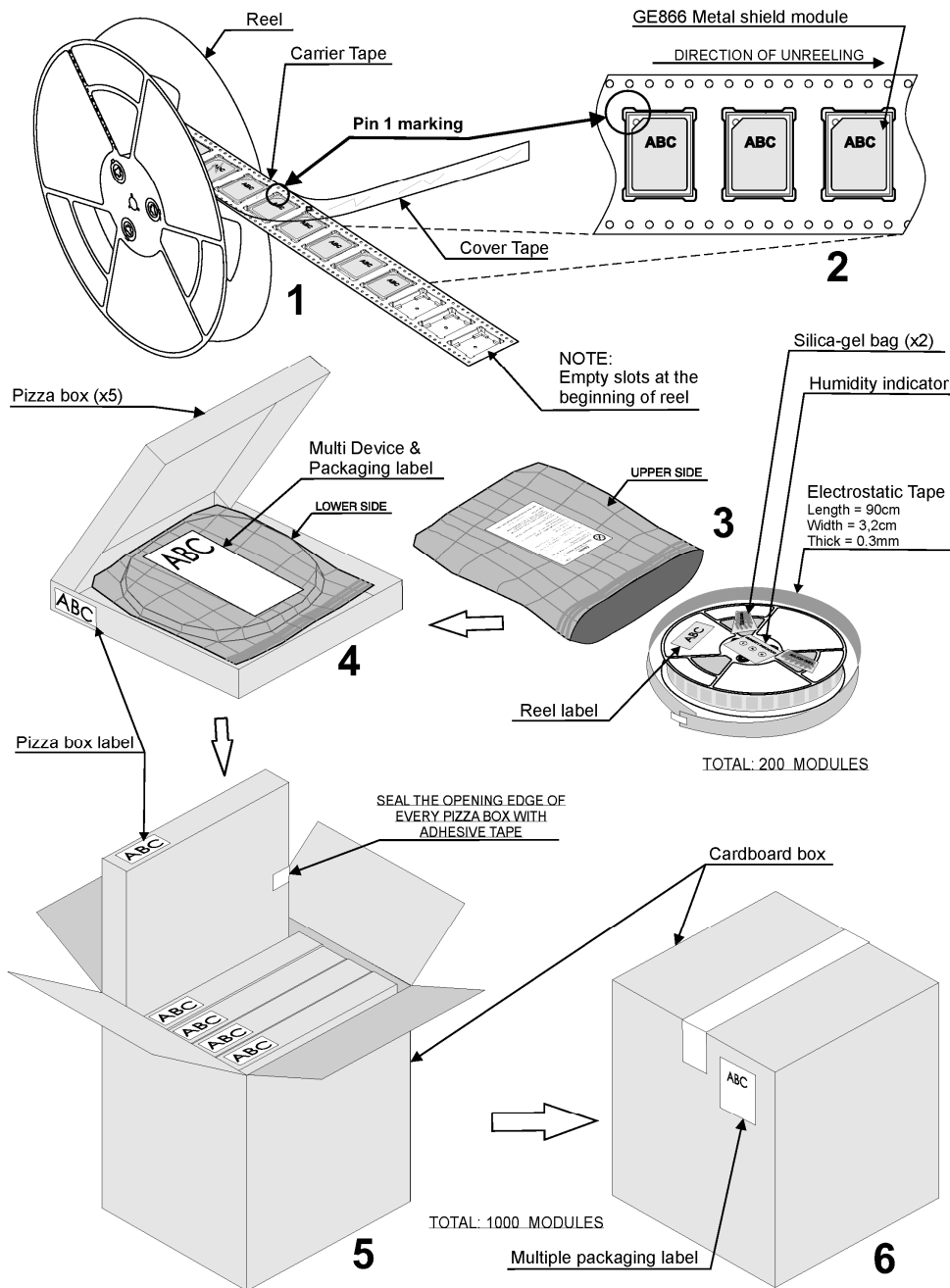
9.1. Tray

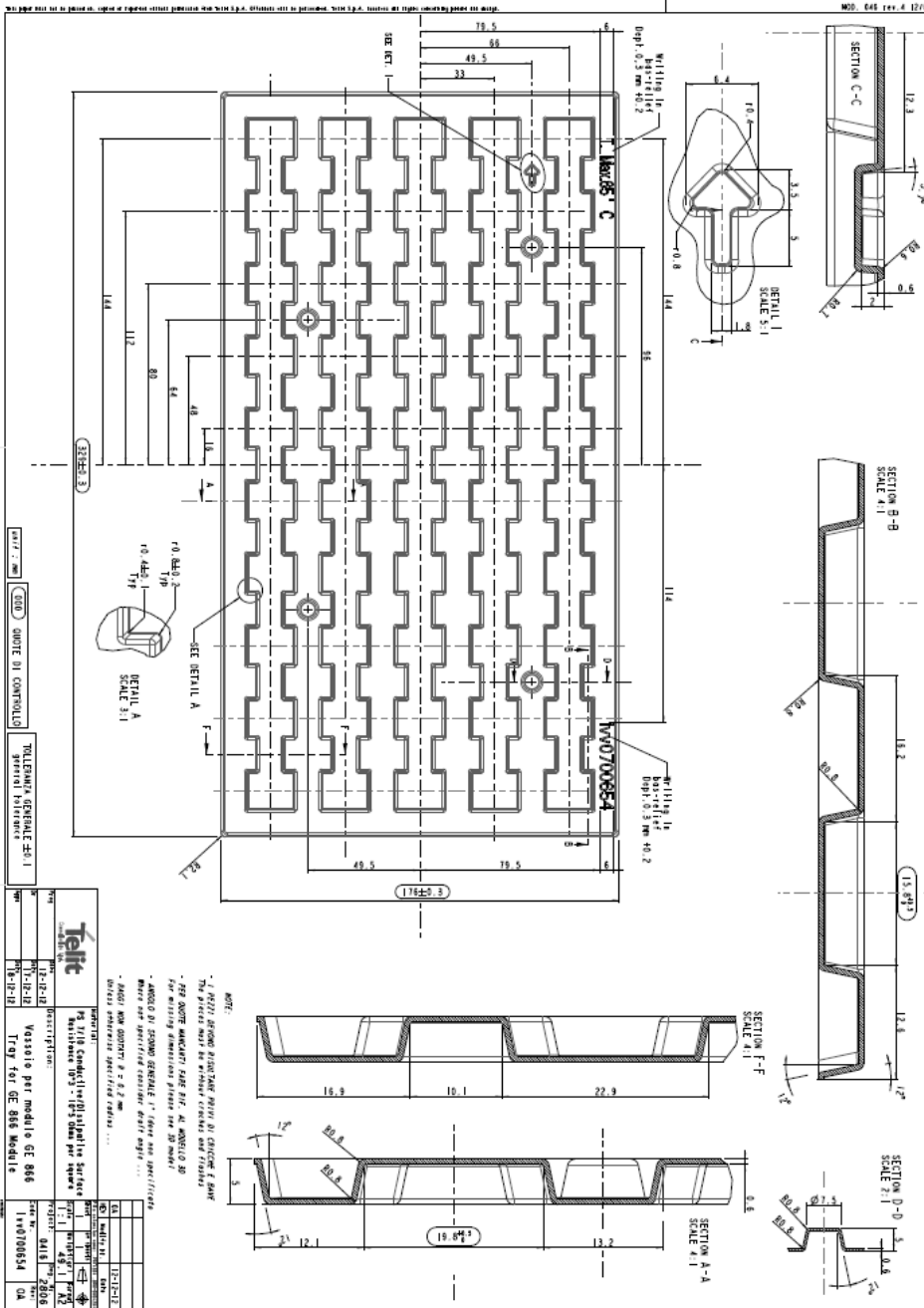
The WE866 modules are packaged on trays of 98 pieces each when small quantities are required (i.e. for test and evaluation purposes).



9.2. Reel

The WE866 modules are packaged on reels of 200 pieces each, see picture below.





Caution or Warning –These trays can withstand at the maximum temperature of 65°C.

9.3. Moisture sensitivity

The moisture sensitivity level of the Product is “3” according with standard IPC/JEDEC J-STD-020, take care of all the relative requirements for using this kind of components.

Moreover, the customer has to take care of the following conditions:

- a) The shelf life of the Product inside of the dry bag is 12 months from the bag seal date, when stored in a non-condensing atmospheric environment of $< 40^{\circ}\text{C}$ and $< 90\% \text{ RH}$.
- b) Environmental condition during the production: $\leq 30^{\circ}\text{C}$ / $60\% \text{ RH}$ according to IPC/JEDEC J-STD-033B.
- c) The maximum time between the opening of the sealed bag and the reflow process must be 168 hours if condition b) “IPC/JEDEC J-STD-033B paragraph 5.2” is respected.
- d) Baking is required if conditions b) or c) are not respected
- e) Baking is required if the humidity indicator inside the bag indicates $10\% \text{ RH}$ or more.

10. CONFORMITY ASSESSMENT ISSUES

10.1. FCC/IC Regulatory notices

Modification statement

Telit has not approved any changes or modifications to this device by the user. Any changes or modifications could void the user's authority to operate the equipment.

Telit n'approuve aucune modification apportée à l'appareil par l'utilisateur, quelle qu'en soit la nature. Tout changement ou modification peuvent annuler le droit d'utilisation de l'appareil par l'utilisateur.

Interference statement

This device complies with Part 15 of the FCC Rules and Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Wireless notice

This equipment complies with FCC and IC radiation exposure limits set forth for an uncontrolled environment. The antenna should be installed and operated with minimum distance of 20 cm between the radiator and your body. Antenna gain must be below:

| | WE866A1-P |
|-------------|---|
| Type | Dipole ½-wave antenna RP-SMA connector |
| Gain | 2.2 dBi |

nel Cet appareil est conforme aux limites d'exposition aux rayonnements de la IC pour un environnement non contrôlé. L'antenne doit être installé de façon à garder une distance minimale de 20 centimètres entre la source de rayonnements et votre corps. Gain de l'antenne doit être ci-dessous:

L'émetteur ne doit pas être colocalisé ni fonctionner conjointement avec à autre antenne ou autre émetteur.

| | WE866A1-P |
|-------------|---|
| Type | Dipole ½-wave antenna RP-SMA connector |
| Gain | 2.2 dBi |

FCC Class B digital device notice

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.

Labelling Requirements for the Host device

The host device shall be properly labelled to identify the modules within the host device. The certification label of the module shall be clearly visible at all times when installed in the host device, otherwise the host device must be labelled to display the FCC ID and IC of the module, preceded by the words "Contains transmitter module", or the word "Contains", or similar wording expressing the same meaning, as follows:

Contains FCC ID: RI7WE866A1P Contains IC: 5131A- WE866A1P

L'appareil hôte doit être étiqueté comme il faut pour permettre l'identification des modules qui s'y trouvent. L'étiquette de certification du module donné doit être posée sur l'appareil hôte à un endroit bien en vue en tout temps. En l'absence d'étiquette, l'appareil hôte doit porter une étiquette donnant le FCC ID et le IC du module, précédé des mots « Contient un module d'émission », du mot « Contient » ou d'une formulation similaire exprimant le même sens, comme suit :

Contains FCC ID: RI7WE866A1P Contains IC: 5131A- WE866A1P

CAN ICES-3 (B) / NMB-3 (B)

This Class B digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de classe B est conforme à la norme canadienne ICES-003

10.2. 2014/53/EU Directive

This device has been evaluated against the essential requirements of the 2014/53/EU Directive.

| | |
|-----------|---|
| Bulgarian | С настоящето "Telit Communications S.P.A." декларира, че "WE866" отговаря на съществените изисквания и другите приложими изисквания на Директива 2014/53/ЕС. |
| Croatian | Ovime "Telit Communications S.P.A.", izjavljuje da je ovaj "WE866 MODULE" je u skladu s osnovnim zahtjevima i drugim relevantnim odredbama Direktive 2014/53/EU. |
| Czech | "Telit Communications S.P.A." tímto prohlašuje, že tento "WE866 MODULE" je ve shodě se základními požadavky a dalšími příslušnými ustanoveními směrnice 2014/53/ES. |
| Danish | Undertegnede "Telit Communications S.P.A." erklærer herved, at følgende udstyr "WE866 MODULE" overholder de væsentlige krav og øvrige relevante krav i direktiv 2014/53/EF. |
| Dutch | Hierbij verklaart "Telit Communications S.P.A." dat het toestel "WE866 MODULE" in overeenstemming is met de essentiële eisen en de andere relevante bepalingen van richtlijn 2014/53/EG. |
| English | Hereby, "Telit Communications S.P.A.", declares that this "WE866 MODULE" is in compliance with the essential requirements and other relevant provisions of Directive 2014/53/EU. |
| Estonian | Käesolevaga kinnitab "Telit Communications S.P.A." seadme "WE866 MODULE" vastavust direktiivi 2014/53/EÜ põhinõuetele ja nimetatud direktiivist tulenevatele teistele asjakohastele sätetele. |
| German | Hiermit erklärt "Telit Communications S.P.A.", dass sich das Gerät "WE866 MODULE" in Übereinstimmung mit den grundlegenden Anforderungen und den übrigen einschlägigen Bestimmungen der Richtlinie 2014/53/EG befindet. |
| Greek | ΜΕ ΤΗΝ ΠΑΡΟΥΣΑ "Telit Communications S.P.A." ΔΗΛΩΝΕΙ ΟΤΙ "WE866 MODULE" ΣΥΜΜΟΡΦΩΝΕΤΑΙ ΠΡΟΣ ΤΙΣ ΟΥΣΙΩΔΕΙΣ ΑΠΑΙΤΗΣΕΙΣ ΚΑΙ ΤΙΣ ΛΟΙΠΕΣ ΣΧΕΤΙΚΕΣ ΔΙΑΤΑΞΕΙΣ ΤΗΣ ΟΔΗΓΙΑΣ 2014/53/ΕΚ. |
| Hungarian | Alulírott, "Telit Communications S.P.A." nyilatkozom, hogy a "WE866 MODULE" megfelel a vonatkozó alapvető követelményeknek és az 2014/53/EU irányelv egyéb előírásainak. |
| Finnish | "Telit Communications S.P.A." vakuuttaa täten että "WE866 MODULE" tyyppinen laite on direktiivin 2014/53/EY oleellisten vaatimusten ja sitä koskevien direktiivin muiden ehtojen mukainen. |
| French | Par la présente "Telit Communications S.P.A." déclare que l'appareil "WE866 MODULE" est conforme aux exigences essentielles et aux autres dispositions pertinentes de la directive 2014/53/CE. |
| Icelandic | Hér með lýsir "Telit Communications S.P.A." yfir því að "WE866 MODULE" er í samræmi við grunnkröfur og aðrar kröfur, sem gerðar eru í tilskipun 2014/53/EU |
| Italian | Con la presente "Telit Communications S.P.A." dichiara che questo "WE866 MODULE" è conforme ai requisiti essenziali ed alle altre disposizioni pertinenti stabilite dalla direttiva 2014/53/CE. |
| Latvian | Ar šo "Telit Communications S.P.A." deklarē, ka "WE866 module" atbilst Direktīvas 2014/53/EK būtiskajām prasībām un citiem ar to saistītajiem noteikumiem. |

| | |
|------------|--|
| Lithuanian | Šiuo "Telit Communications S.P.A." deklaruoja, kad šis "WE866 module" atitinka esminius reikalavimus ir kitas 2014/53/EB Direktyvos nuostatas. |
| Maltese | Hawnhekk, "Telit Communications S.P.A.", jiddikjara li dan "WE866 module" jikkonforma mal-ħtiġijiet essenzjali u ma provvedimenti oħrajn relevanti li hemm fid-Dirrettiva 2014/53/EU. |
| Norwegian | "Telit Communications S.P.A." erklærer herved at utstyret "WE866 module" er i samsvar med de grunnleggende krav og øvrige relevante krav i direktiv 2014/53/EF. |
| Polish | Niniejszym "Telit Communications S.P.A." oświadcza, że "WE866 module" jest zgodny z zasadniczymi wymogami oraz pozostałymi stosownymi postanowieniami Dyrektywy 2014/53/EU |
| Portuguese | "Telit Communications S.P.A." declara que este "WE866 module" está conforme com os requisitos essenciais e outras disposições da Directiva 2014/53/CE. |
| Slovak | "Telit Communications S.P.A." týmto vyhlasuje, že "OM12030/X00" (*) spĺňa základné požiadavky a všetky príslušné ustanovenia Smernice 2014/53/ES. |
| Slovenian | "Telit Communications S.P.A." izjavlja, da je ta "WE866 module" v skladu z bistvenimi zahtevami in ostalimi relevantnimi določili direktive 2014/53/ES. |
| Spanish | Por medio de la presente "Telit Communications S.P.A." declara que "WE866 module" cumple con los requisitos esenciales y cualesquiera otras disposiciones aplicables o exigibles de la Directiva 2014/53/CE. |
| Swedish | Härmed intygar "Telit Communications S.P.A." att denna "WE866 module" står i överensstämmelse med de väsentliga egenskapskrav och övriga relevanta bestämmelser som framgår av direktiv 2014/53/EG. |

In order to satisfy the essential requirements of R&TTE Directive (2014/53/EU), the product is compliant with the following standards:

| | |
|-----------------------------------|---|
| RF spectrum use (R&TTE art. 3.2) | EN 300 328 v2.1.1 |
| EMC (R&TTE art. 3.1b) | EN 301 489-1 V2.1.0 EN 301 489-17 V3.1.0 |
| Health & Safety (R&TTE art. 3.1a) | EN 60950-1:2006 + A2:2013 EN 62311:2008 |

The conformity assessment procedure referred to in Article 10 and detailed in Annex IV of Directive 2014/53/EU has been followed with the involvement of the following Notified Body:

AT4 wireless, S.A.
Parque Tecnológico de Andalucía
C/ Severo Ochoa 2
29590 Campanillas – Málaga
SPAIN
Notified Body No: 1909

Thus, the following marking is included in the product:



There is no restriction for the commercialization of this device in all the countries of the European Union.

Final product integrating this module must be assessed against essential requirements of the 2014/53/EU (RED) Directive. It should be noted that assessment does not necessarily lead to testing. Telit Communications S.p.A. recommends carrying out the following assessments:

| | |
|--------------------------------|---|
| RF spectrum use (RED art 3.2) | It will depend on the antenna used on the final product |
| EMC (RED art 3.1b) | Testing |
| Health & Safety (RED art 3.1a) | Testing |

11. SAFETY RECOMMENDATIONS

11.1. READ CAREFULLY

Be sure the use of this product is allowed in the country and in the environment required. The use of this product may be dangerous and has to be avoided in the following areas:

- Where it can interfere with other electronic devices in environments such as hospitals, airports, aircrafts, etc.
- Where there is risk of explosion such as gasoline stations, oil refineries, etc. It is the responsibility of the user to enforce the country regulation and the specific environment regulation.

Do not disassemble the product; any mark of tampering will compromise the warranty validity. We recommend following the instructions of the hardware user guides for correct wiring of the product. The product has to be supplied with a stabilized voltage source and the wiring has to be conformed to the security and fire prevention regulations. The product has to be handled with care, avoiding any contact with the pins because electrostatic discharges may damage the product itself. Same cautions have to be taken for the SIM, checking carefully the instruction for its use. Do not insert or remove the SIM when the product is in power saving mode.

The system integrator is responsible for the functioning of the final product; therefore, care has to be taken to the external components of the module, as well as any project or installation issue, because the risk of disturbing the GSM network or external devices or having impact on the security. Should there be any doubt, please refer to the technical documentation and the regulations in force. Every module has to be equipped with a proper antenna with specific characteristics. The antenna has to be installed with care in order to avoid any interference with other electronic devices and has to guarantee a minimum distance from the body (20 cm). In case this requirement cannot be satisfied, the system integrator has to assess the final product against the SAR regulation.

The European Community provides some Directives for the electronic equipment introduced on the market. All of the relevant information is available on the European Community website:

<http://ec.europa.eu/enterprise/sectors/rtte/documents/>

The text of the Directive 99/05 regarding telecommunication equipment is available, while the applicable Directives (Low Voltage and EMC) are available at:

<http://ec.europa.eu/enterprise/sectors/electrical/>

12. ACRONYMS

| | |
|-------|---|
| TTSC | Telit Technical Support Centre |
| USB | Universal Serial Bus |
| HS | High Speed |
| DTE | Data Terminal Equipment |
| UMTS | Universal Mobile Telecommunication System |
| WCDMA | Wideband Code Division Multiple Access |
| HSDPA | High Speed Downlink Packet Access |
| HSUPA | High Speed Uplink Packet Access |
| UART | Universal Asynchronous Receiver Transmitter |
| HSIC | High Speed Inter Chip |
| SIM | Subscriber Identification Module |
| SPI | Serial Peripheral Interface |
| ADC | Analog – Digital Converter |
| DAC | Digital – Analog Converter |
| I/O | Input Output |
| GPIO | General Purpose Input Output |
| CMOS | Complementary Metal – Oxide Semiconductor |
| MOSI | Master Output – Slave Input |
| MISO | Master Input – Slave Output |
| CLK | Clock |
| MRDY | Master Ready |

| | |
|------|------------------------------|
| SRDY | Slave Ready |
| CS | Chip Select |
| RTC | Real Time Clock |
| PCB | Printed Circuit Board |
| ESR | Equivalent Series Resistance |
| VSWR | Voltage Standing Wave Ratio |
| VNA | Vector Network Analyzer |

13. DOCUMENT HISTORY

| Revision | Date | Changes |
|----------|------------|--|
| 0 | 2016-10-27 | First issue |
| 1 | 2016-12-06 | Updated Pin Out Table |
| 2 | 2017-11-22 | Update Par. 9- Packaging |
| 3 | 2018-03-13 | Updated Par.10- Conformity assessment issues |



SUPPORT INQUIRIES

Link to www.telit.com and contact our technical support team for any questions related to technical issues.

www.telit.com



Telit Communications S.p.A.
Via Stazione di Prosecco, 5/B
I-34010 Sgonico (Trieste), Italy

Telit Wireless Solutions Inc.
3131 RDU Center Drive, Suite 135
Morrisville, NC 27560, USA

Telit Wireless Solutions Ltd.
10 Habarzel St.
Tel Aviv 69710, Israel

Telit IoT Platforms LLC
5300 Broken Sound Blvd, Suite 150
Boca Raton, FL 33487, USA

Telit Wireless Solutions Co., Ltd.
8th FL., Shinyoung Securities Bld.
6, Gukjegeumyung-ro8-gil, Yeongdeungpo-gu
Seoul, 150-884, Korea

Telit Wireless Solutions
Tecnologia e Servicos Ltda
Avenida Paulista, 1776, Room 10.C
01310-921 São Paulo, Brazil

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