

# WE865-DUAL Hardware User Guide

1vv0300787 Rev. 1 - 03/10/08



**WE865-DUAL HW User Guide**  
1vv0300787 Rev. 1 - 03/10/08

This document is relating to the following products:

Short range	
Wi-Fi 802.11 b+g	
<b>WE865-DUAL</b> Accessory for GE863-PRO <sup>3</sup>	
WE865DUA000-001	



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# 1 Overview

This document is a user guide for developing a wireless application which integrates the Telit WE865-DUAL with the GE863-PRO<sup>3</sup> GSM/GPRS module creating a unique solution for a short and long range.

This document cannot embrace the whole hardware solutions and products that may be designed. The information given is a guide line and a starting point for properly developing products with the Telit WE865-DUAL module.

For further hardware details please refer to the Telit "WE865-DUAL Product Description" document.

## NOTICE

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**(EN) The integration of the Wi-Fi WE865-DUAL module within user application shall be done according to the design rules described in this manual.**

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**(IT) L'integrazione del modulo Wi-Fi WE865-DUAL all'interno dell'applicazione dell'utente dovrà rispettare le indicazioni progettuali descritte in questo manuale.**

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**(DE) Die integration des Wi-Fi WE865-DUAL Moduls in ein Gerät muß gemäß der in diesem Dokument beschriebenen Konstruktionsregeln erfolgen.**

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**(SL) Integracija Wi-Fi WE865-DUAL modula v uporabniški aplikaciji bo morala upoštevati projektna navodila, opisana v tem piročniku.**

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**(SP) La utilización del modulo Wi-Fi WE865-DUAL debe ser conforme a los usos para los cuales ha sido diseñado descritos en este manual del usuario.**

---

**(FR) L'intégration du module Wi-Fi WE865-DUAL dans l'application de l'utilisateur sera faite selon les règles de conception décrites dans ce manuel.**

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**Wi-Fi WE865-DUAL – את ההנחיות המפורטות במסמך זה בהתהליך האינטגרציה של מודם ה- עם המוצר**

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## 1.1 Related documents

The following documents are related to this user guide:

- [1] Telit WE865-DUAL Product Description 80312ST10046A
- [2] Telit WE865-DUAL Software User Guide 1vv0300788
- [3] Telit GE863-PRO<sup>3</sup> Hardware User Guide 1vv0300773a
- [4] Telit GE863-PRO<sup>3</sup> Software User Guide 1vv0300788
- [5] Telit GE863PRO<sup>3</sup> EVK User Guide 1vv0300776
- [6] Telit GE863PRO<sup>3</sup> Linux SW User Guide 1vv0300781
- [7] Telit GE863PRO3Linux Development Environment User Guide1vv0300780

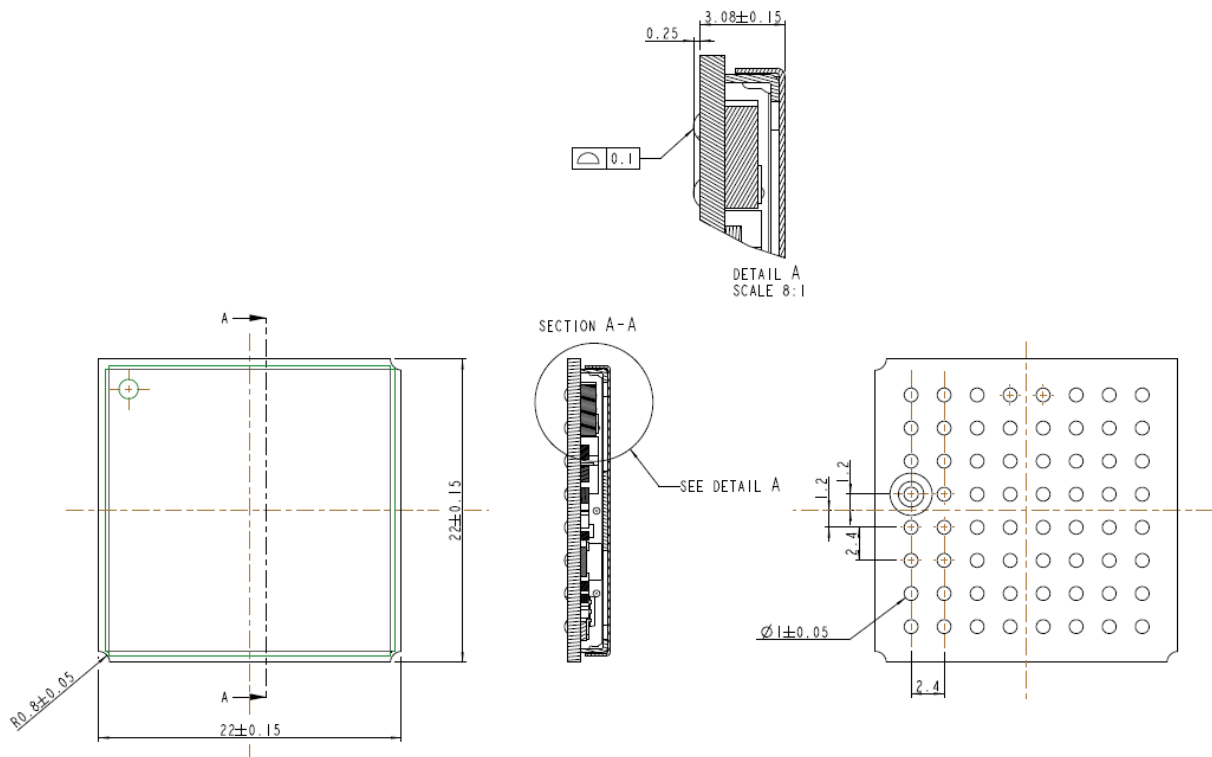
All documentation can be downloaded from Telit's official web site [www.telit.com](http://www.telit.com) if not otherwise indicated.



## 2 Mechanical description

The **Telit WE865-DUAL module** overall dimensions are:

- **Length:** 22.15 mm (max)
- **Width:** 22.15 mm (max)
- **Thickness:** 3.48 mm (max)
- **Weight** 3.5 g

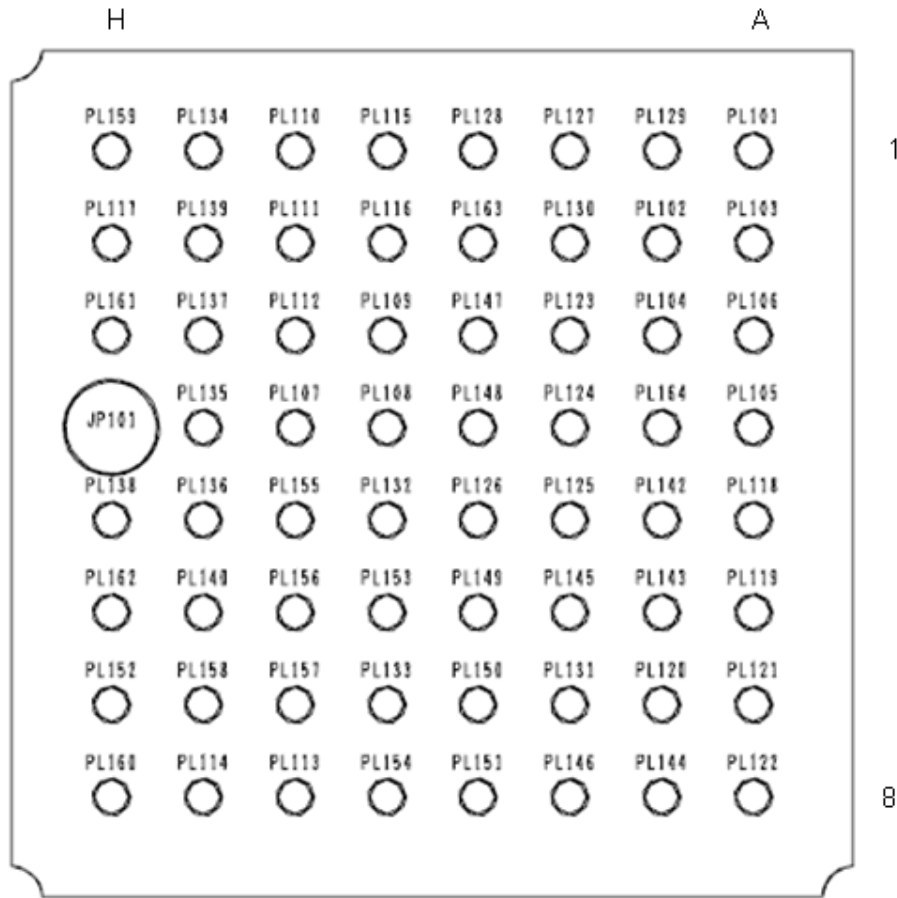


**Figure 1**





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**Figure 2 (Bottom side)**



## 3 Pin-out

### 3.1 Pin table

Ball	Signal	I/O	Function	Internal PULL UP/DOWN	Type
<b>SDIO</b>					
A1	SDIO[0]	I/O	SDIO DATA[0] (or SPI MISO)	10KOhm pull-up	SDIO (or SPI)
B2	SDIO[1]	I/O	SDIO DATA[1] (or SPI INTERRUPT)	10KOhm pull-up	SDIO (or SPI)
A2	SDIO[2]	I/O	SDIO DATA[2]	10KOhm pull-up	SDIO
B3	SDIO[3]	I/O	SDIO DATA[3] (or SPI CHIP SELECT)	10KOhm pull-up	SDIO (or SPI)
A3	SDIO_CLK	I/O	SDIO CLOCK (or SPI CLOCK)	-	SDIO (or SPI)
A4	SDIO_CMD	I/O	SDIO CMD (or SPI MOSI )	10KOhm pull-up	SDIO (or SPI)
<b>Testing and Certification</b>					
C3	TEST_1	O	Test line n. 1	-	TEST
C4	TEST_2	I	Test line n. 2	-	TEST
C5	TEST_3	I	Test line n. 3	-	TEST
D5	TEST_4	I	Test line n. 4	-	TEST
<b>Miscellaneous Functions</b>					
B1	EN_A*	I	Enable/shut-down	10KOhm pull-up 100KOhm pull-up	control
C1	MR_RESET*	I	Manual reset	10KOhm pull-up 47KOhm pull-down	control
D1	EN_B*	I	Enable/shut-down	10KOhm pull-up 47KOhm pull-down	control
D2	RESET	I	Reset for host processor	-	control
H5	RF_ANT	RF	RF output	-	antenna
<b>Power Supply</b>					
E1	VDD	PWR	Power input pin	-	power supply
E2	VDD	PWR	Power input pin	-	power supply
F1	VCC_A	PWR	Power input pin	-	power supply
F2	VCC_A	PWR	Power input pin	-	power supply
F3	VCC_A	PWR	Power input pin	-	power supply
<b>RESERVED<sup>1</sup></b>					
A5			N.C.		
A6			N.C.		

<sup>1</sup> All the reserved pins must be kept not connected (N.C.)



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Ball	Signal	I/O	Function	Internal PULL UP/DOWN	Type
A7			N.C.		
A8			N.C.		
B4			N.C.		
B5			N.C.		
B6			N.C.		
B7			N.C.		
B8			N.C.		
C5			N.C.		
C6			N.C.		
C8			N.C.		
D3			N.C.		
D4			N.C.		
D6			N.C.		
D7			N.C.		
D8			N.C.		
E3			N.C.		
E4			N.C.		
E6			N.C.		
E8			N.C.		
F4			N.C.		
F5			N.C.		
F6			N.C.		
F7			N.C.		
F8			N.C.		
G2			N.C.		
G6			N.C.		
G7			N.C.		
G8			N.C.		
H1			N.C.		
H2			N.C.		
H4			N.C.		
H7			N.C.		
H8			N.C.		

Table 1



## 3.2 Ball grid

	A	B	C	D	E	F	G	H
1	SDIO[0]	EN_A*	MR_RESET*	EN_B*	VDD	VCC_A	GND	NC
2	SDIO[2]	SDIO[1]	GND	RESET	VDD	VCC_A	NC	NC
3	SDIO_CLK	SDIO[3]	TEST_1	NC	NC	VCC_A	GND	GND
4	SDIO_CMD	NC	TEST_2	NC	NC	NC	GND	NC
5	NC	NC	TEST_3	TEST_4	GND	NC	GND	RF_ANT
6	NC	NC	NC	NC	NC	NC	NC	GND
7	NC	NC	GND	NC	GND	NC	NC	NC
8	NC	NC	NC	NC	NC	NC	NC	NC

**Table 2**

**NOTE:** The drawing above is a top view.



## 4 Electrical description

The power supply circuitry and board layout are a very important part in the full product design and they strongly reflect on the product overall performances, hence read carefully the requirements and the guidelines that will follow for a proper design.

### 4.1 Power supply

Powering of the module:

- wide range voltage operation from 3.4V up to 4.2V (typical voltage 3.8V) the same as for GE863-PRO<sup>3</sup>.

The above voltage range is chosen in order to use the same voltage range for the Wi-Fi module WE865-DUAL and the GE863-PRO<sup>3</sup>.

#### 4.1.1 Unique supply voltage for WE865-DUAL and GE863-PRO<sup>3</sup>

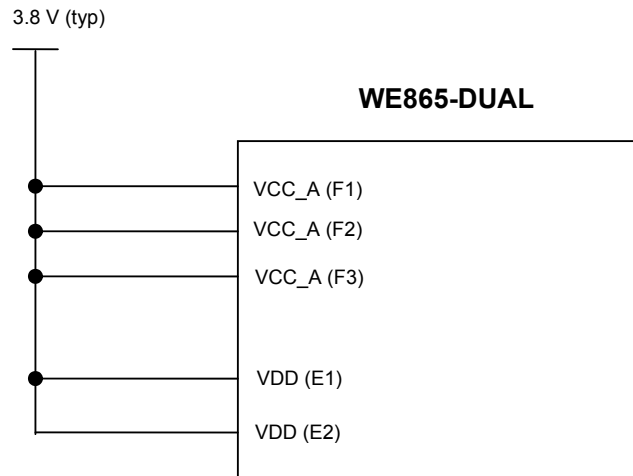
In order to get the suitable voltage range valid for both WE865-DUAL and GE863-PRO<sup>3</sup> certain balls need to be connected as described below.

signal	ball	3.8V (typ)
VCC_A	F1	√
	F2	√
	F3	√
VDD	E1	√
	E2	√

**Table 3**



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**Figure 3**

The table below shows the operating and absolute voltage ranges.

<b>VOLTAGE RANGES @ 25 °C</b>			
	<b>Min [V]</b>	<b>Typ [V]</b>	<b>Max [V]</b>
Operating range	3.4	3.8	4.2

**Table 4**



#### 4.1.1.1 Current consumption

CURRENT CONSUMPTION @ 3.8V at 25 °C		
Operating mode	Typ	Unit
Continuous Receive	100	mA
Continuous Transmit (maximum output power)	180	mA
Stand-by (receive beacons every 100 ms)	5	mA
Deep Sleep	3	mA
Shut-down mode	<1	mA

**Table 5**

**NOTE:** continuous receive and transmit mode measures were taken at channel 6.

#### 4.1.1.2 Shut-down mode

In order to minimize the current consumption it is possible to completely shut-down the WE865-DUAL. That is achieved by acting on the relevant signal outside the module, which directly acts on the power device enable/Shut-down signals.

The shut-down is achievable by driving low both the EN\_B\* (ball D1) and EN\_A\* (ball B1) signals, to be connected together.

As EN\_B\* (ball D1) and EN\_A\* (ball B1) are internally connected to pull-up, do not drive these signals during normal operation.

LOGIC CONFIGURATION			
signal	ball	Shut-down mode	Operating mode
EN_A*	B1	to be driven low	internally pulled-up <sup>2</sup>
EN_B*	D1	to be driven low	internally pulled-up <sup>1</sup>

**Table 6**

<sup>2</sup> If the shut-down mode is not used, no external connection is needed.



VOLTAGE LEVELS @ 25 °C		
SIGNAL	VIL	
	Min [V]	Max [V]
EN_A*, EN_B*	0	0.20

Table 7

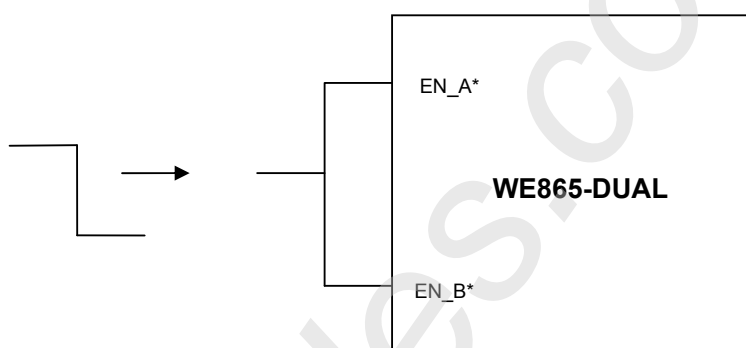


Figure 4

## 4.2 Power supply design guidelines

The power supply circuitry is a very important part in the full product design and it strongly affects the product overall performances, hence read carefully the requirements and the guidelines that will follow for a proper design.

The table below shows the WE865-DUAL operating voltage range:

VOLTAGE RANGE	
Nominal Supply Voltage	3.8V
Minimum Supply Voltage	3.4V
Max Supply Voltage	4.2V

Table 8

The electrical design of the power supply strongly depends on the power source the current is drained from. Please refer to electrical design guidelines in the GE863-PRO<sup>3</sup> Hardware User Guide for further information.





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### 4.2.1 +5V input source

A linear regulator can be used to generate the 3.8V output voltage. When using a linear regulator, a proper heat sink shall be provided in order to dissipate the generated power. A protection diode should be inserted close to the power input, in order to save the WE865-DUAL from power polarity inversion. This can be the same diode as for spike protection.

The figure below shows a possible solution for the switching power supply. It must be taken into account that the power supply performance strongly depends on the layout design.

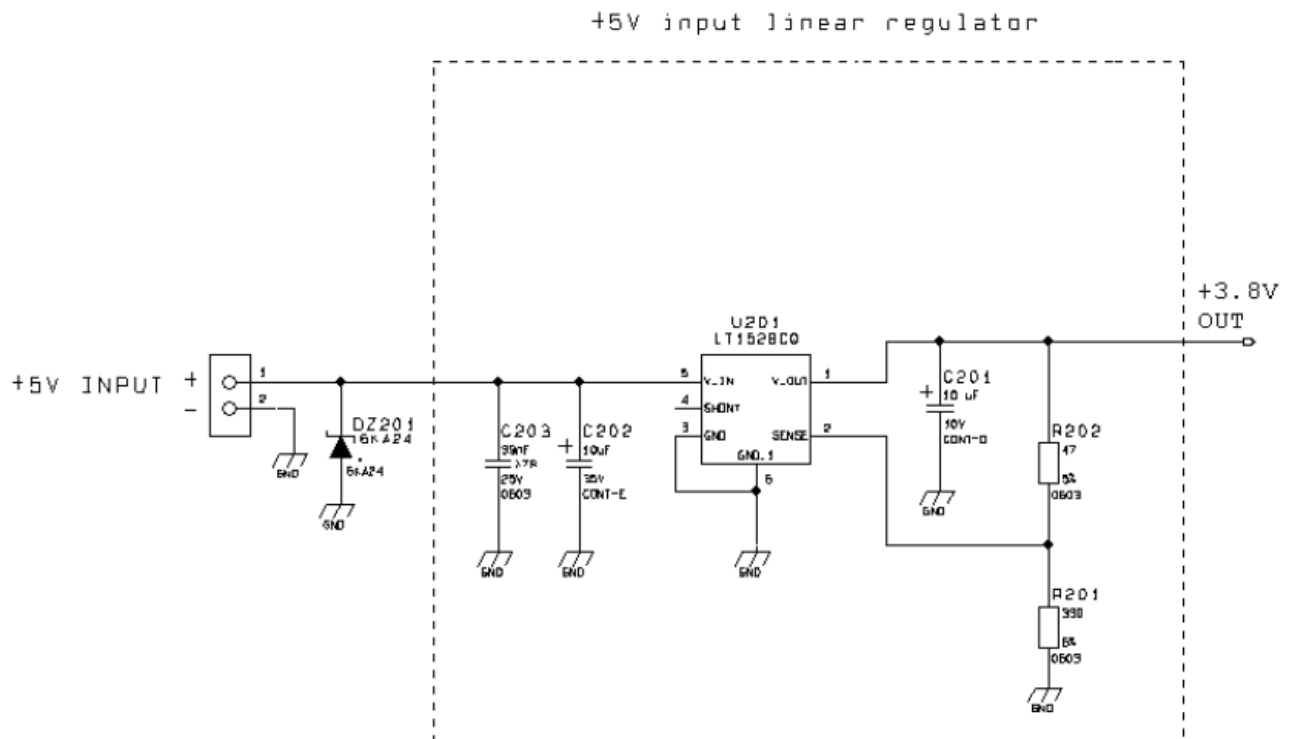


Figure 5



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## 4.2.2 +12V input source

Due to the big difference between the input source and the desired output voltage, a linear voltage regulator is not suited and not recommended. A switching power supply will be preferable because of its better efficiency especially in presence of peak current load.

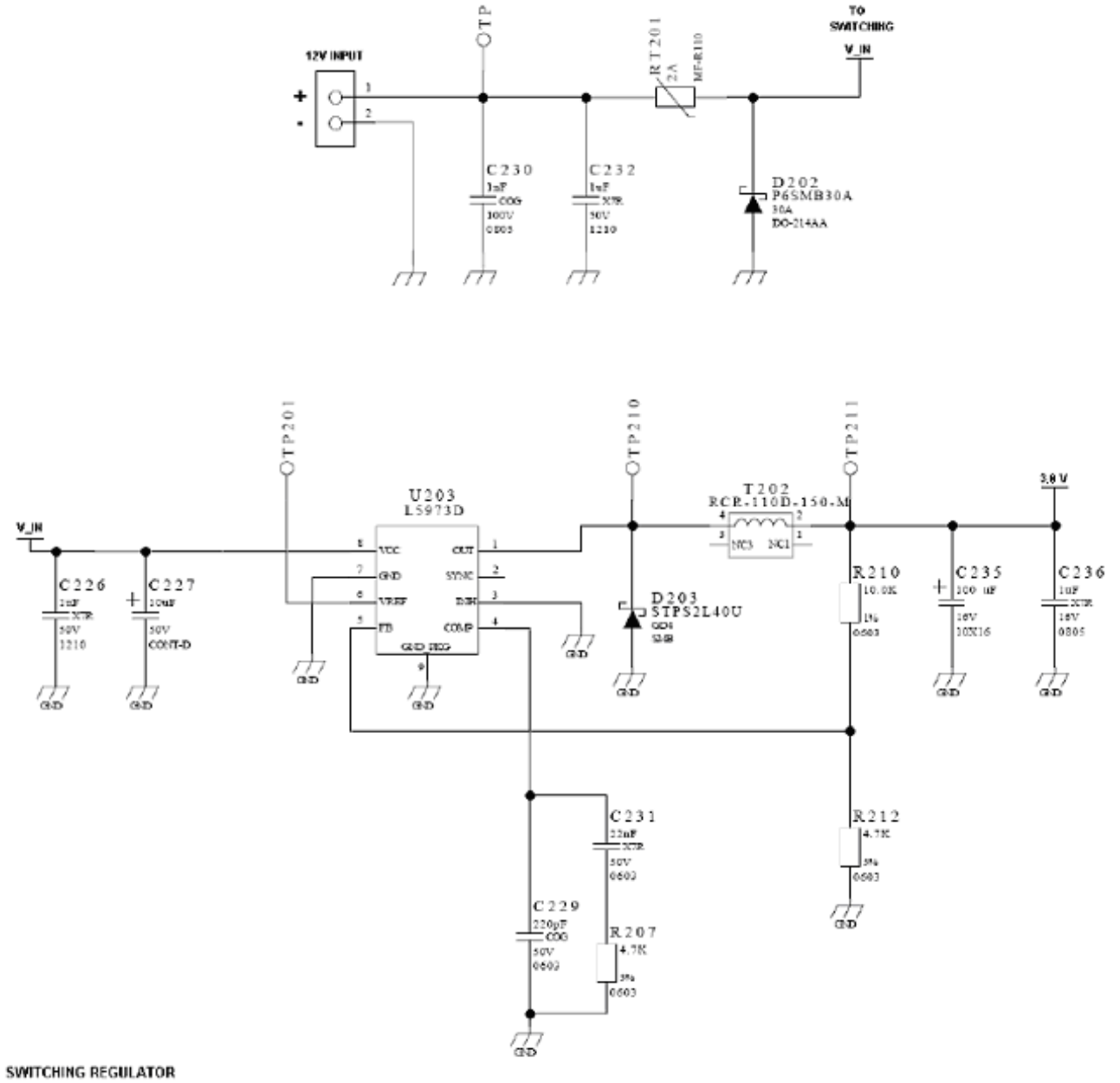
When using a switching regulator, 500 kHz switching frequency (or more) is preferable because of its smaller inductor size and its faster transient response. This allows the regulator to respond quickly to any current peak absorption.

A protection diode should be inserted close to the power input, in order to save the WE865-DUAL from power polarity inversion. This can be the same diode as for spike protection.

The figure below shows a possible solution for the switching power supply. It must be taken into consideration that the switching power supply performances strongly depend on the layout design.



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SWITCHING REGULATOR

Figure 6



## 4.2.3 Battery source

The desired nominal output for the power supply is 3.8V and the maximum voltage allowed is 4.2V, thus a single 3.7V Li-Ion cell battery type is suited for supplying the power to the WE865-DUAL module.

**Please refer to GE863-PRO<sup>3</sup> electrical design guidelines for further information regarding type and battery usage.**

A protection diode should be inserted close to the power input, in order to save the WE865-DUAL from power polarity inversion. Otherwise the battery connector should be done in a way to avoid polarity inversions when connecting the battery.

When integrating the GE863-PRO<sup>3</sup> with the WE865-DUAL modules together in the user application, take into account that battery charger control circuitry is embedded inside the GE863-PRO<sup>3</sup> (please refer to GE863-PRO<sup>3</sup> Hardware User Guide for more details) and can be used with Li-ION batteries only. Using other type of batteries, an external charger will be needed.

The battery capacity should be suitably chosen dependently on the customer's application current consumption and the battery life requirements. When integrating the GE863-PRO<sup>3</sup> with the WE865-DUAL modules together in the user application, the battery capacity must be at least 800mAh in order to withstand any current peak (please refer to GE863-PRO<sup>3</sup> Hardware User Guide for more details).

## 4.3 Reset signals

The WE865-DUAL has a power-on-reset (POR) circuit inside, so no specific reset is required in the initialization phase.

Two signals are available to reset the module:

- an active high host reset (RESET)
- an active low manual reset (MR\_RESET\*)

In addition to the active high RESET signal issued by the host system (GE863-PRO<sup>3</sup>), a reset button can be integrated in the customer application.

Even if it is not mandatory to drive the available reset lines in the module, it is recommended to employ those signals to prevent critical situations.

When resetting during normal operation, after the release of the reset the module is unconditionally shut down, without doing any detach operation from the network where it is associated.



### 4.3.1 Reset

An active high host reset (RESET, ball D2), allowing the WE865-DUAL to be reset by an external device (host).

This pin is internally pulled-down, do not drive the signal during normal operation.

**The signal must be asserted for a period greater than 1ms.**

VOLTAGE LEVELS @ 25 °C			
	Min [V]	Max [V]	Remark
VIH	2,0	3,0	-

Table 9

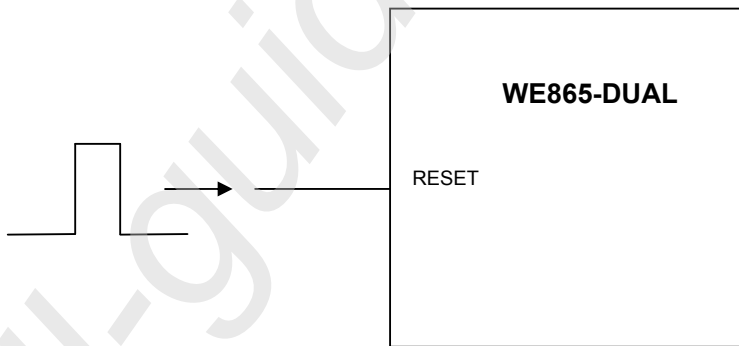


Figure 7



### 4.3.2 Manual reset

An active low manual reset (MR\_RESET\*, ball C1), see the table below for the allowed voltage levels. As the pin is internally pulled-up, do not drive the signal during normal operation. **The signal must be asserted for a period greater than 1ms.**

VOLTAGE LEVELS @ 25 °C			
	Min [V]	Max [V]	Remark
VIL	-0,3	0,825	

Table 10

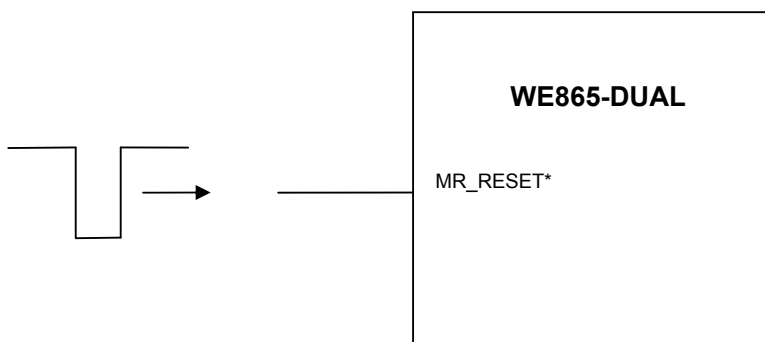


Figure 8



## 4.4 SDIO signals

A 4-data bit SDIO interface is available on the WE865-DUAL that must be connected to the host processor (Telit GE863-PRO<sup>3</sup>).

WE865-DUAL SDIO voltage levels are fully compatible with the GE863-PRO<sup>3</sup> I/O voltage levels.

47 Ohm series resistor on each SDIO line and 12pF capacitor on clock line must be inserted in order to avoid noise (see Electrical design guidelines chapter). Refer to §8.2.

Voltage levels for all the SDIO pins are reported in the table:

VOLTAGE LEVELS @ 25 °C			
	Min [V]	Max [V]	Remark
VIL	-0,3	0,825	
VIH	2,0625	3,6	
VOL	0	0,125	I = 4mA
VOH	2,475	3,3	I = 4mA

Table 11



## 5 Thermal design guidelines

The thermal design for the power supply heat sink should be done taking into account the current consumption involved in the appropriate power supply configuration. Please refer to §4.1.1.1 for detailed information on the current consumption.





## 6 PCB layout design guidelines

In case of implementing the input power supply circuitry as described in the previous §4.2.2, the PCB traces connecting the switching output to the inductor and the switching diode must be as short as possible. It is recommended to place the inductor and the diode very close to the power switching IC. This is done in order to reduce the radiated field (noise) of the switching frequency (100-500 kHz usually).

The use of a good common ground plane is generally suggested. The placement of the power supply on the board should be done in such a way to guarantee that the high current return paths in the ground plane are not overlapped to any noise sensitive lines. The power supply input cables should be kept separate from noise sensitive lines.



## 7 Antenna

The antenna connection and board layout design are the most important part in the full product design and they strongly reflect on the product overall performances, hence read carefully and follow the requirements and the guidelines for a proper design.

### 7.1 Wi-Fi antenna guidelines

General guidelines for an antenna and antenna line on PCB for a Telit WE865-DUAL device

ANTENNA REQUIREMENTS	
Frequency range [MHz]	2400-2500
Gain [dBi]	$\leq 2$
Impedance [Ohm]	50
Maximum Input Power [mW]	>100
VSWR recommended	$\leq 2$

Table 12

Frequency range indicated in order to support 14 Wi-Fi channels. Smaller ranges are allowed or requested for application over 11 or 13 channels.

**Please refer to IEEE specifications and to the proper regulatory body directives about 802.11 channels and antenna specifications in different countries.**

When using the Telit WE865-DUAL, since there's no antenna connector on the module, the antenna must be connected to the WE865-DUAL through the PCB with the antenna pad.

Please consider that antenna design and choice is dependent on the specific application.



This transmission line shall fulfill the following requirements:

<b>ANTENNA LINE ON PCB REQUIREMENTS</b>	
Impedance [Ohm]	50
Maximum Attenuation [dB]	0.3
Coupling with other signals is not allowed	

**Table 13**

## 7.2 Wi-Fi antenna PCB trace guidelines

- Ensure that the antenna line impedance is 50 ohm.
- Keep the antenna line on the PCB as short as possible in order to limit losses.
- Antenna line must have uniform characteristics, constant cross section, avoid meanders and abrupt curves.
- Keep, if possible, one layer of the PCB used only for the Ground plane.
- Surround (on the sides, over and under) the antenna line on PCB with Ground, avoid having other signal tracks facing directly the antenna line track.
- The ground around the antenna line on PCB has to be strictly connected to the Ground Plane by placing vias once per 2mm at least.
- Place EM noisy devices as far as possible from WE865-DUAL antenna line.
- Keep the antenna line far away from the WE865-DUAL power supply lines.
- If you have EM noisy devices around the PCB hosting the WE865-DUAL, such as fast switching ICs, take care of the shielding of the antenna line by burying it inside the layers of PCB and surround it with Ground planes, or shield it with a metal frame cover.
- If you don't have EM noisy devices around the PCB of WE865-DUAL, by using a strip-line on the superficial copper layer for the antenna line, the line attenuation will be lower than a buried one.



## 7.3 Wi-Fi antenna installation guidelines

- Install the antenna in a place covered by the Wi-Fi signal.
- The antenna must be installed to provide a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter.
- Antenna shall not be installed inside metal cases.
- Antenna shall be installed also according Antenna manufacturer instructions.



## 8 Integration with the GE863-PRO<sup>3</sup>

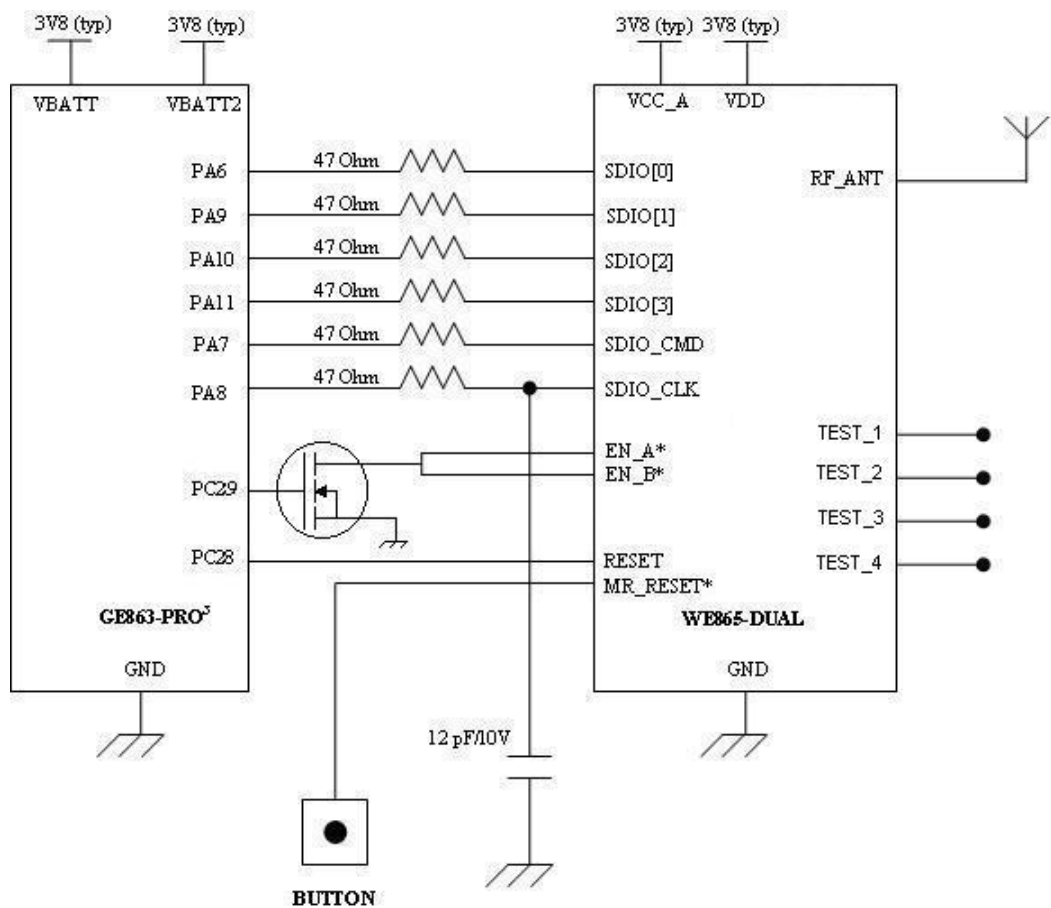


Figure 9 (Block diagram)

**NOTE:** It is mandatory to leave available the TEST lines in the customer design:

- TEST\_1
- TEST\_2
- TEST\_3
- TEST\_4



## 8.1 Power supply

When integrating the WE865-DUAL with the Telit GE863-PRO<sup>3</sup> module, as described in previous chapters a 3.8V (typ) voltage must be provided to the WE865-DUAL.

The WE865-DUAL power enable signals (EN\_A\* and EN\_B\*) must be connected together and be driven by the GE863-PRO<sup>3</sup> GPIO PC29 (ball F5) through a N-channel MOSFET.

In the GE863-PRO<sup>3</sup> the power supply inputs of the GSM engine and the ARM processor part have been kept separate, VBATT is the input for the GSM part, VBATT2 is the input for ARM.

It is possible to connect together the two power inputs since they have compatible ranges, but if it is desired the two power supplies can be kept separate.

If keeping separated VBATT and VBATT2 is the chosen solution, the WE865-DUAL 3.8V power balls (VCC\_A) should be connected to the same voltage source feeding VBATT2.

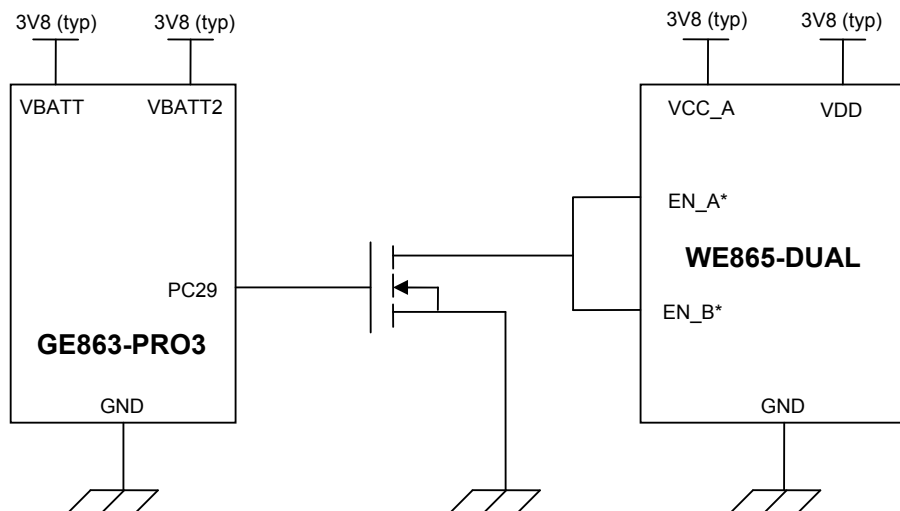


Figure 10



## 8.2 SDIO signals

A 4-data bit SDIO interface is available on the WE865-DUAL that must be connected to the host processor (Telit GE863-PRO<sup>3</sup>).

The WE865-DUAL SDIO voltage levels are fully compatible with the GE863-PRO<sup>3</sup> I/O voltage levels. 47 Ohm series resistor on each SDIO line and 12pF capacitor on clock line must be inserted in order to avoid noise (see Electrical design guidelines chapter). Refer to block diagram in Figure 7.

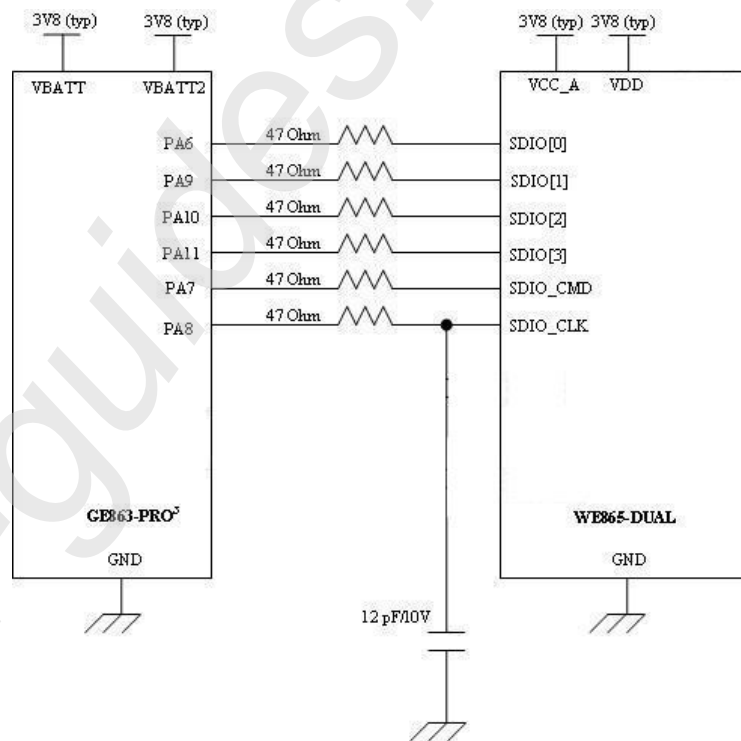


Figure 11



## 9 WE865-DUAL - Evaluation kit

The WE865-DUAL can be provided with an evaluation/testing kit.  
The kit consists of:

- EVK-PRO<sup>3</sup> evaluation kit for GE863-PRO<sup>3</sup> module (EVK-PRO<sup>3</sup> main board + GE863-PRO<sup>3</sup> interface board)
- WE865-DUAL interface board

In such a case, the WE865-DUAL module is directly soldered on its interface board. The figure below shows how the boards must be assembled in order to allow the system working.

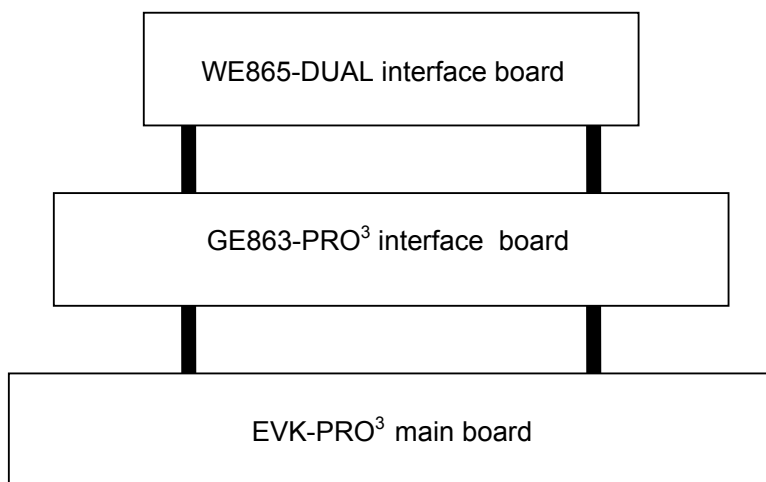


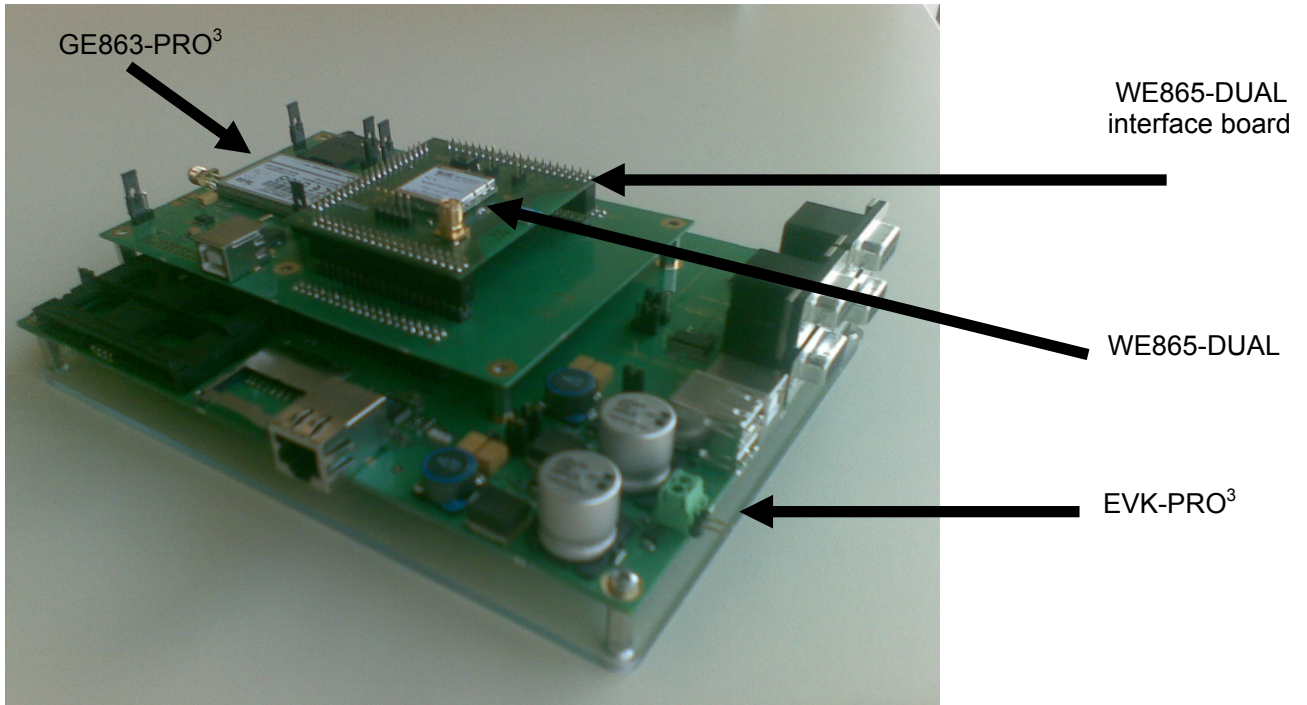
Figure 12

All the boards are connected each other via 40-pins connectors.  
The core of the evaluation system is the EVK-PRO<sup>3</sup> EVALUATION KIT, which can be split into several functional blocks depending on the implemented function. Refer to the “EVK-PRO<sup>3</sup> User Guide” for additional information on the EVK-PRO<sup>3</sup> description and usage.





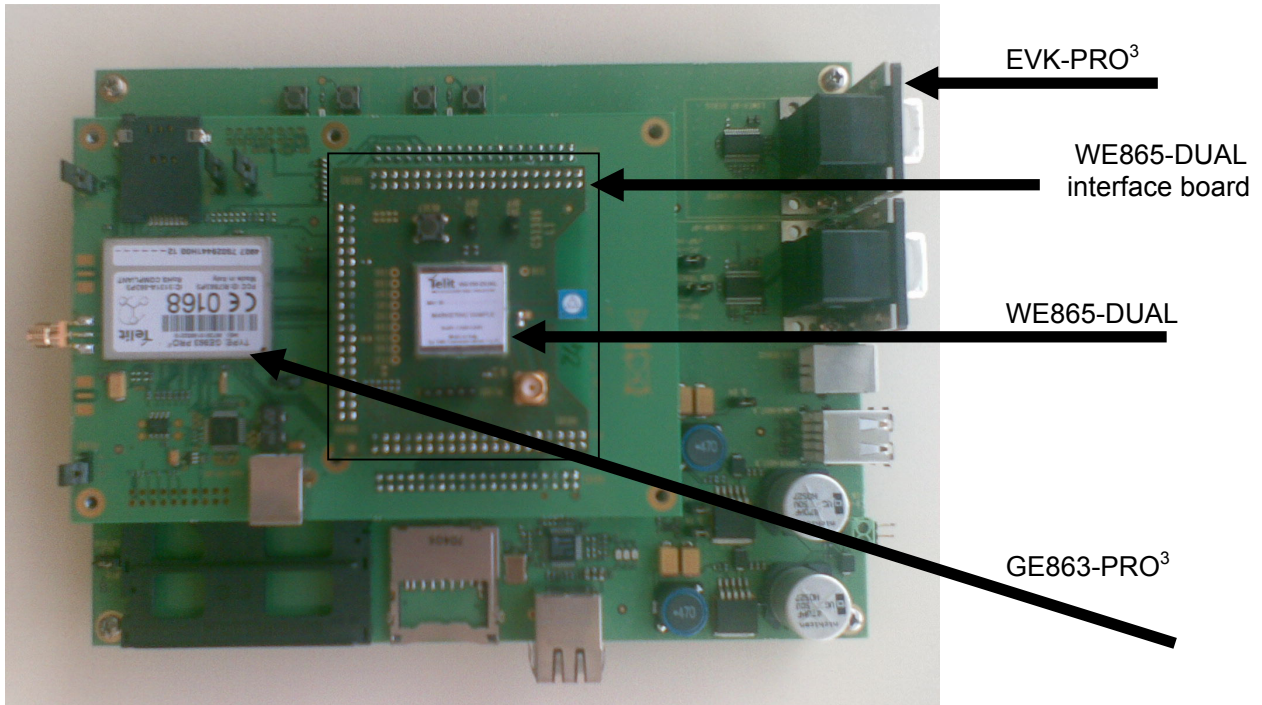
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**Figure 13**



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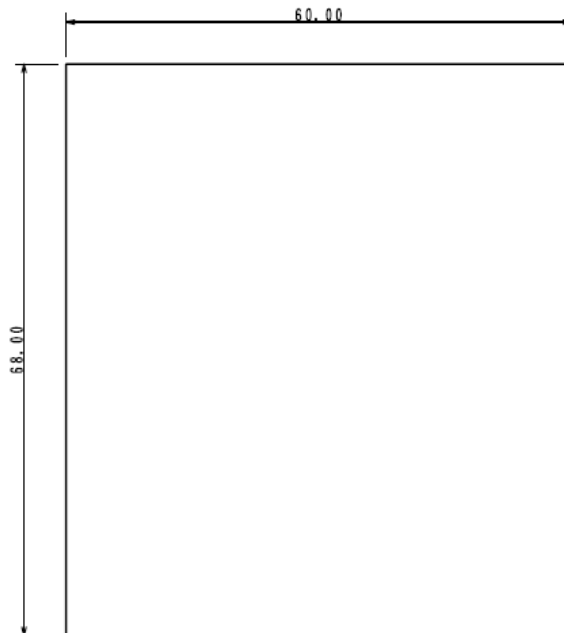


**Figure 14**



## 9.1 WE865-DUAL Interface board

### 9.1.1 Mechanical description



**Figure 15**



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## 9.1.2 Main components

### Main components TOP side list:

WE865-DUAL module

PL101: 2 pin jumper

PL102: 2 pin jumper

SW101: Reset button – Push to drive MR\_RESET\* low

SO104: RF connector (alternative to AT101)

PL103: 5 pin header - SPI for test

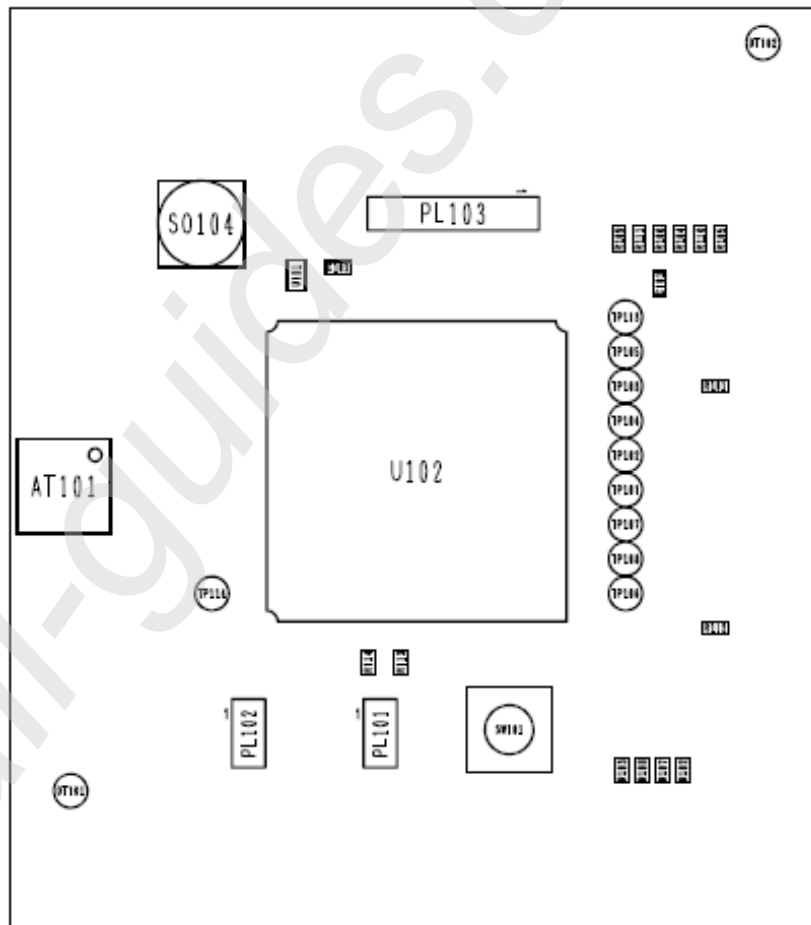


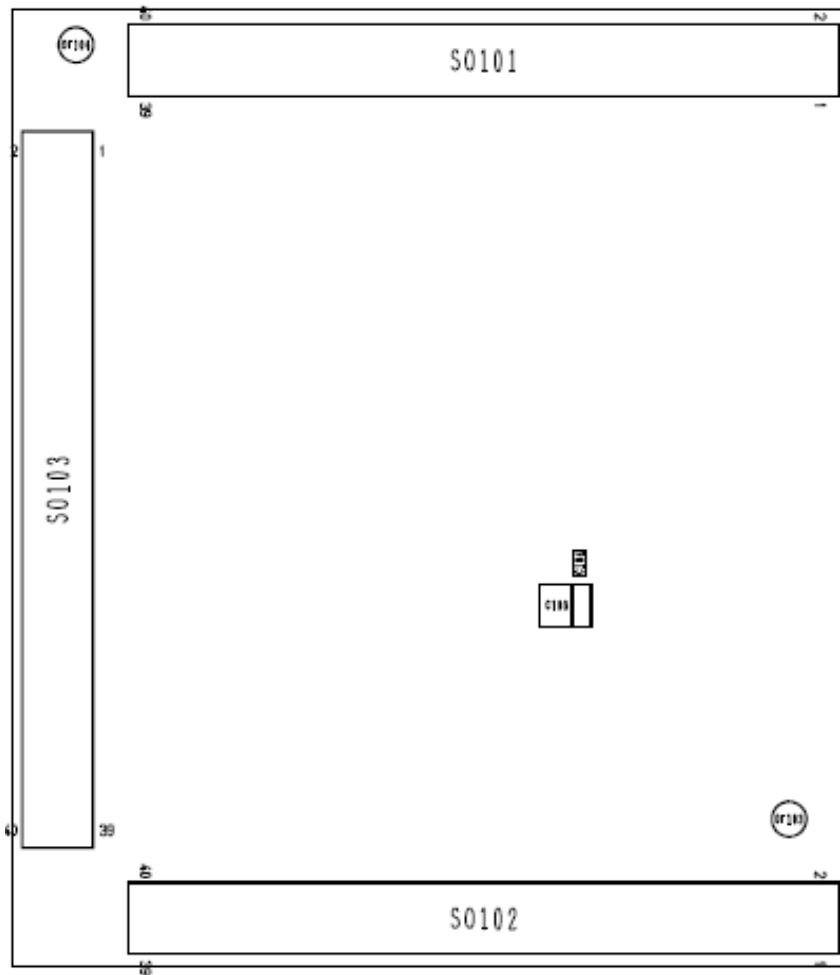
Figure 16



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**Main components BOTTOM side list:**

- SO101: Interface connector
- SO102: Interface connector
- SO103: Interface connector

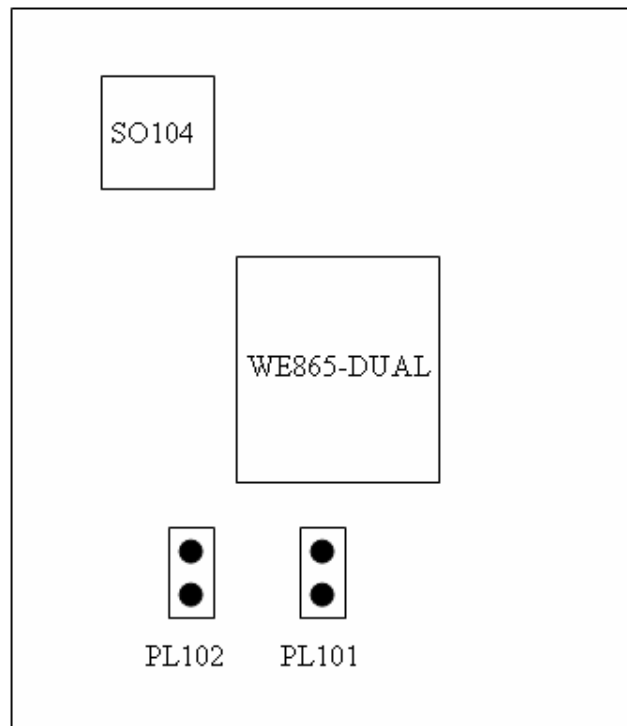


**Figure 17**



### 9.1.3 Jumpers settings

The figure below shows the PL101 and PL102 jumpers on the TOP side in the interface board



**Figure 18**

PL101 - Short the jumper to drive EN\_A\* low  
PL102 - Short the jumper to drive EN\_B\* low



## 9.1.4 Pin table

	SO101	SO102	SO103	PL103
Pin n.	Signal name	Signal name	Signal name	Signal name
1	RESERVED	RESERVED	RESERVED	TEST_1
2	RESERVED	RESERVED	RESERVED	TEST_2
3	RESERVED	RESERVED	RESERVED	TEST_3
4	RESERVED	RESERVED	RESERVED	TEST_4
5	RESERVED	RESERVED	RESERVED	GND
6	RESERVED	RESERVED	RESERVED	-
7	SDIO[0]	RESERVED	RESERVED	-
8	SDIO_CMD	RESERVED	RESERVED	-
9	SDIO_CLK	RESERVED	RESERVED	-
10	SDIO[1]	RESERVED	RESERVED	-
11	SDIO[2]	RESERVED	RESERVED	-
12	SDIO[3]	RESERVED	RESERVED	-
13	RESERVED	RESERVED	RESERVED	-
14	RESERVED	RESERVED	RESERVED	-
15	RESERVED	RESERVED	RESERVED	-
16	RESERVED	RESERVED	RESERVED	-
17	RESERVED	RESERVED	RESERVED	-
18	RESERVED	RESERVED	RESERVED	-
19	RESERVED	RESERVED	RESERVED	-
20	RESERVED	RESERVED	RESERVED	-
21	RESERVED	RESERVED	RESERVED	-
22	RESERVED	RESERVED	RESERVED	-
23	RESERVED	RESERVED	RESERVED	-
24	RESERVED	RESERVED	RESERVED	-
25	RESERVED	RESERVED	RESERVED	-
26	RESERVED	RESERVED	RESERVED	-
27	RESERVED	RESERVED	RESERVED	-
28	RESERVED	RESERVED	RESERVED	-
29	RESERVED	RESERVED	RESET	-
30	RESERVED	RESERVED	RESERVED	-
31	RESERVED	RESERVED	RESERVED	-
32	RESERVED	RESERVED	RESERVED	-
33	RESERVED	RESERVED	RESERVED	-
34	RESERVED	RESERVED	RESERVED	-
35	RESERVED	RESERVED	RESERVED	-
36	VBATT	RESERVED	RESERVED	-
37	RESERVED	RESERVED	GND	-
38	RESERVED	RESERVED	RESERVED	-
39	GND	GND	GND	-
40	GND	GND	RESERVED	-

Table 14



# 10 Mounting the WE865-DUAL on the application board

The Telit WE865-DUAL module has been designed in order to be compliant with a standard lead-free SMT process.

## 10.1 Stencil

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

## 10.2 PCB pad design

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

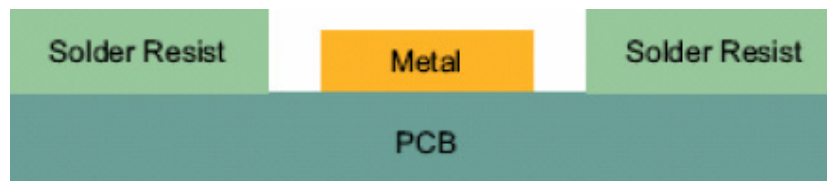
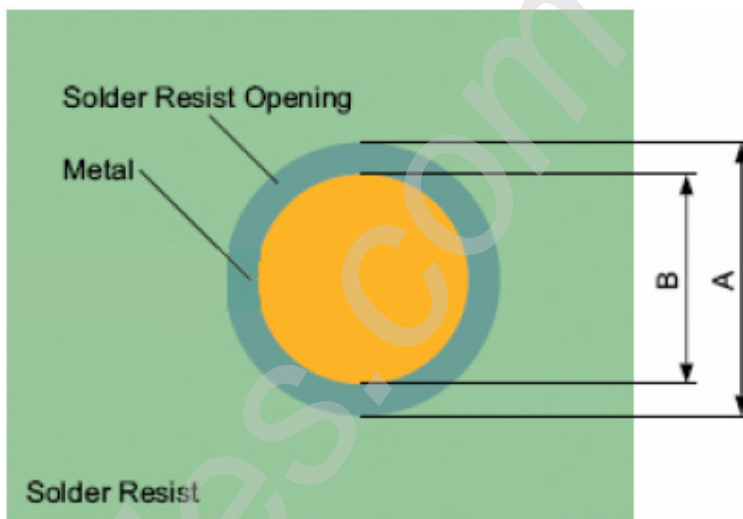


Figure 19







**Figure 20**

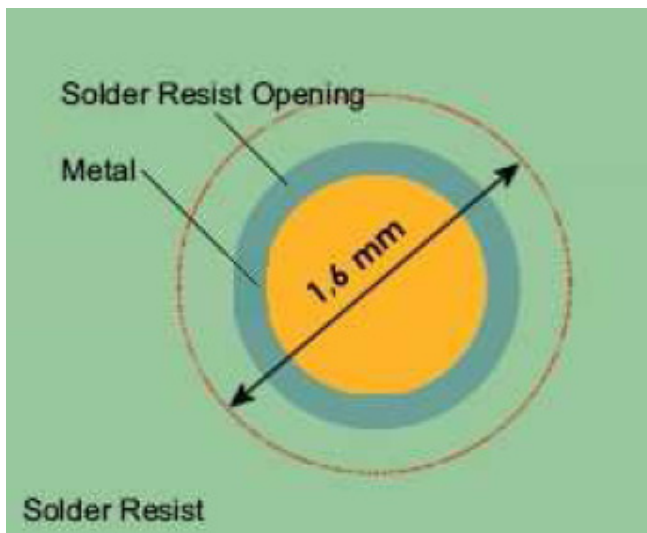
Recommendations for PCB pad dimensions

Dimension	Value [mm]
Ball pitch	2
Solder resist opening diameter A	1,150
Metal PAD diameter B	1 +/- 0,05

**Table 15**

Placement of microvias not covered by solder resist is not recommended inside the “Solder resist Opening”, unless the microvia carry the same signal of the pad itself.





**Figure 21**

Holes in pad are allowed only for blind holes and not for through holes.  
Recommendations for PCB pad surfaces:

Finish	Layer tickness [um]	Properties
Electro-less Ni / Immersion Au	3-7 / 0,05-0,15	good solder ability protection, high shear force values

**Table 16**

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 wet-ability of tin-lead solder paste on the described surface plating is better compared to lead-free solder paste.



### 10.3 Solder paste

	<b>Lead free</b>
<b>Solder paste</b>	Sn / Ag / Cu

Table 17

### 10.4 Solder reflow

The following is the recommended solder reflow profile

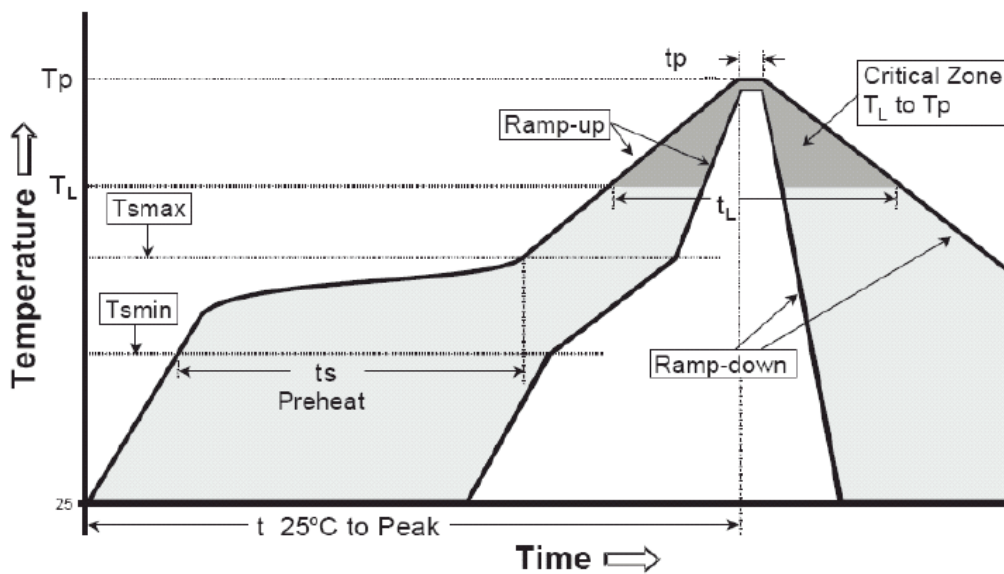


Figure 22



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Profile Feature	Pb-Free Assembly
Average ramp-up rate (TL to TP)	3 °C / second max
Preheat:	150 °C
- Temperature Min (T <sub>min</sub> )	200 °C
- Temperature Max (T <sub>max</sub> )	60-180
- Time (min to max) (ts)	seconds
T <sub>max</sub> to TL:	3 °C / second max
- Ramp-up rate	max
Time maintained above:	217 °C
- Temperature (TL)	60-150
- Time (tL)	seconds
Peak Temperature (T <sub>p</sub> ):	245 + 0/-5 °C
Time within 5 °C of actual Peak Temperature (t <sub>p</sub> )	10-30 seconds
Ramp-down rate	6 °C/second max
Time 25 °C to Peak Temperature	8 minutes max

**Table 18**

**NOTE:** All temperatures refer to topside of the package, measured on the package body surface.

**IMPORTANT: WE865-DUAL module can accept only one reflow process**



# 11 Moisture sensitivity

The level of moisture sensibility of Telit WE865-DUAL modules 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:

- The shelf life of WE865 inside of the dry bag shall be 12 month from the bag seal date, when stored in a non-condensing atmospheric environment of  $<40^{\circ}\text{C}$  / 90% RH
- Environmental condition during the production:  $\leq 30^{\circ}\text{C}$  / 60% RH according to IPC/JEDEC J-STD-033A paragraph 5
- The maximum time between the opening of the sealed bag and the reflow process shall be 168 Hours if the condition b) “IPC/JEDEC J-STD-033A paragraph 5.2” is respected
- A baking is required if conditions b) or c) are not respected
- A baking is required if the humidity indicator inside the bag indicates 10% RH or more



## 12 Conformity assessment issues

Assessment of the final product must be made against the Essential requirements of the R&TTE Directive Articles 3.1(a) and (b), safety and EMC respectively, and any relevant Article 3.3 requirements.

The WE865-DUAL module is conform with the following European Union Directives:

- R&TTE Directive 1999/5/EC (Radio Equipment & Telecommunications Terminal Equipments)
- Low Voltage Directive 73/23/EEC and product safety
- Directive 89/336/EEC for conformity for EMC

In order to satisfy the essential requisite of the R&TTE 99/5/EC directive, the WE865-DUAL module is compliant with the following standards:

- Use of RF Spectrum. Standard: EN 300 328 v1.7.1 (2006-10)
- EMC (Electromagnetic Compatibility). Standards: EN 301 489-1 and EN 301 489-17
- LVD (Low Voltage Directive) Standards: EN 60 950

The WE865-DUAL module is conform with the following US Directives:

- Use of RF Spectrum. Standards: FCC 47 Part 15
- EMC (Electromagnetic Compatibility). Standards: FCC 47 Part 15

To meet the FCC's RF exposure rules and regulations:

- The system antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20 cm from all the persons and must not be co-located or operating in conjunction with any other antenna or transmitter.
- The system antenna(s) used for this module must not exceed 2 dBi for all operating configurations.
- Users and installers must be provided with antenna installation instructions and transmitter operating conditions for satisfying RF exposure compliance.

Manufacturers of mobile, fixed or portable devices incorporating this module are advised to clarify any regulatory questions and to have their complete product tested and approved for FCC compliance.



## 13 Safety recommendations

### **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 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 a correct wiring of the product. The product has to be supplied with a stabilized voltage source and the wiring has to be conforming 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.

The system integrator is responsible of the functioning of the final product; therefore, care has to be taken to the external components of the module, as well as of any project or installation issue, because the risk of disturbing the external networks or 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 of this requirement cannot be satisfied, the system integrator has to assess the final product against the SAR regulation EN 50360.

The European Community provides some Directives for the electronic equipments introduced on the market. All the relevant information's are available on the European Community website:

<http://europa.eu.int/comm/enterprise/rtte/dir99-5.htm>

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

[http://europa.eu.int/comm/enterprise/electr\\_equipment/index\\_en.htm](http://europa.eu.int/comm/enterprise/electr_equipment/index_en.htm)



# 14 Document change log

Revision	Date	Changes
ISSUE#0	20/08/08	Preliminary Release
ISSUE#1	03/10/08	Updated mechanical dimensions Updated pin-out and ball grid Updated power configuration section Added current consumption Updated reset section Updated antenna section Updated integration section with GE863-PRO <sup>3</sup> Updated evaluation kit section Added conformity assessment issues section Added safety recommendations section

