

ME50-169 RF Module User Guide

1v0300981 Rev.3 – 2013-11-06



APPLICABILITY TABLE

| PRODUCT |
|----------|
| ME50-169 |



SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE

Notice

While reasonable efforts have been made to assure the accuracy of this document, Telit assumes no liability resulting from any inaccuracies or omissions in this document, or from use of the information obtained herein. The information in this document has been carefully checked and is believed to be entirely reliable. However, no responsibility is assumed for inaccuracies or omissions. Telit reserves the right to make changes to any products described herein and reserves the right to revise this document and to make changes from time to time in content hereof with no obligation to notify any person of revisions or changes. Telit does not assume any liability arising out of the application or use of any product, software, or circuit described herein; neither does it convey license under its patent rights or the rights of others.

It is possible that this publication may contain references to, or information about Telit products (machines and programs), programming, or services that are not announced in your country. Such references or information must not be construed to mean that Telit intends to announce such Telit products, programming, or services in your country.

Copyrights

This instruction manual and the Telit products described in this instruction manual may be, include or describe copyrighted Telit material, such as computer programs stored in semiconductor memories or other media. Laws in the Italy and other countries preserve for Telit and its licensors certain exclusive rights for copyrighted material, including the exclusive right to copy, reproduce in any form, distribute and make derivative works of the copyrighted material. Accordingly, any copyrighted material of Telit and its licensors contained herein or in the Telit products described in this instruction manual may not be copied, reproduced, distributed, merged or modified in any manner without the express written permission of Telit. Furthermore, the purchase of Telit products shall not be deemed to grant either directly or by implication, estoppel, or otherwise, any license under the copyrights, patents or patent applications of Telit, as arises by operation of law in the sale of a product.

Computer Software Copyrights

The Telit and 3rd Party supplied Software (SW) products described in this instruction manual may include copyrighted Telit and other 3rd Party supplied computer programs stored in semiconductor memories or other media. Laws in the Italy and other countries preserve for Telit and other 3rd Party supplied SW certain exclusive rights for copyrighted computer programs, including the exclusive right to copy or reproduce in any form the copyrighted computer program. Accordingly, any copyrighted Telit or other 3rd Party supplied SW computer programs contained in the Telit products described in this instruction manual may not be copied (reverse engineered) or reproduced in any manner without the express written permission of Telit or the 3rd Party SW supplier. Furthermore, the purchase of Telit products shall not be deemed to grant either directly or by implication, estoppel, or otherwise, any license under the copyrights, patents or patent applications of Telit or other 3rd Party supplied SW, except for the normal non-exclusive, royalty free license to use that arises by operation of law in the sale of a product.



Usage and Disclosure Restrictions

License Agreements

The software described in this document is the property of Telit and its licensors. It is furnished by express license agreement only and may be used only in accordance with the terms of such an agreement.

Copyrighted Materials

Software and documentation are copyrighted materials. Making unauthorized copies is prohibited by law. No part of the software or documentation may be reproduced, transmitted, transcribed, stored in a retrieval system, or translated into any language or computer language, in any form or by any means, without prior written permission of Telit

High Risk Materials

Components, units, or third-party products used in the product described herein are NOT fault-tolerant and are NOT designed, manufactured, or intended for use as on-line control equipment in the following hazardous environments requiring fail-safe controls: the operation of Nuclear Facilities, Aircraft Navigation or Aircraft Communication Systems, Air Traffic Control, Life Support, or Weapons Systems (High Risk Activities"). Telit and its supplier(s) specifically disclaim any expressed or implied warranty of fitness for such High Risk Activities.

Trademarks

TELIT and the Stylized T Logo are registered in Trademark Office. All other product or service names are the property of their respective owners.

Copyright © Telit Communications S.p.A. 2011.



Contents

| | |
|--|-----------|
| 1. Introduction | 7 |
| 1.1. Scope..... | 7 |
| 1.2. Audience..... | 7 |
| 1.3. Contact Information, Support | 7 |
| 1.4. Document Organization | 8 |
| 1.5. Text Conventions..... | 8 |
| 1.6. Related Documents | 9 |
| 2. Requirements | 10 |
| 2.1. General Requirements | 10 |
| 2.2. 169 MHz band Requirements | 10 |
| 2.3. Other Requirements | 11 |
| 2.4. Functional Requirements | 11 |
| 2.5. Software | 12 |
| 2.6. Temperature Requirements..... | 12 |
| 3. General Characteristics | 13 |
| 3.1. Mechanical Characteristics | 13 |
| 3.2. Mechanical dimensions | 14 |
| 3.3. Recommended Land pattern..... | 14 |
| 3.4. DC Characteristics | 15 |
| 3.5. ME50-169 Functional Characteristics | 16 |
| 3.6. Digital Characteristic | 18 |
| 3.7. Absolute Maximum Ratings..... | 18 |
| 3.8. Ordering Information | 19 |
| 4. Technical Description | 21 |
| 4.1. Module Top View (cover side) | 21 |
| 4.2. Pin-out of the module ME50-169..... | 22 |
| 4.3. Pin-out of the DIP Module | 23 |
| 4.4. Pin-out correspondence table..... | 24 |



- 4.5. Description of the signals 25
- 5. Process Information 26**
 - 5.1. Delivery 26
 - 5.2. Storage 27
 - 5.3. Soldering pad pattern 27
 - 5.4. Solder past 28
 - 5.5. Placement 28
 - 5.6. Soldering Profile (RoHS Process) 28
- 6. Board Mounting Recommendation 30**
 - 6.1. Electrical environment 30
 - 6.2. Power supply decoupling on ME50-169 module 30
 - 6.3. RF layout considerations 31
 - 6.4. Antenna connections on printed circuit boards 32
 - 6.5. ME50-169 Interfacing 33
- 7. EC Declaration of Conformity 36**
- 8. Safety Recommendations 37**
- 9. Glossary 38**
- 10. Document History 39**



1. Introduction

1.1. Scope

Scope of this document is to present the features and the application of the Telit ME50-169 radio modules (ME50-169).

1.2. Audience

This document is intended for developers using Telit ME50-169 radio modules.

1.3. Contact Information, Support

For general contact, technical support, to report documentation errors and to order manuals, contact Telit Technical Support Center (TTSC) at:

TS-SRD@telit.com
TS-NORTHAMERICA@telit.com
TS-LATINAMERICA@telit.com
TS-APAC@telit.com

Alternatively, use:

<http://www.telit.com/en/products/technical-support-center/contact.php>

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

<http://www.telit.com>

To register for product news and announcements or for product questions contact Telit Technical Support Center (TTSC).

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. Document Organization

This document contains the following chapters

[“Chapter 1: “Introduction”](#) provides a scope for this document, target audience, contact and support information, and text conventions.

[“Chapter 2: “Requirements”](#) gives an overview of the limitations imposed by Reference standards.

[“Chapter 3: “General Characteristics”](#) describes in details the characteristics of the product.

[“Chapter 4: “Technical Description”](#) describes in details the signals and pin-out of the product.

[“Chapter 5: “Process information”](#) describes in details the delivery, storage, soldering and placement of the product.

[“Chapter 6: “Board Mounting Recommendations”](#) describes in details the interface and coupling of the product.

[“Chapter 7: “Annexes”](#) describes examples of propagation attenuation.

[“Chapter 8: “Safety Recommendations”](#) describes recommendation for proper usage.

[“Chapter 9: “Glossary”](#) shows acronyms used in the document.

[“Chapter 10: “Document history”](#) describes the revision history of the document.

1.5. 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.



1.6. Related Documents

- [1] EN 300 220-2 v2.3.1, ETSI Standards for SRD , February 2010
- [2] ERC Rec 70-03, ERC Recommendation for SRD, June 2010
- [3] 2002/95/EC, Directive of the European Parliament and of the Council, 27 January 2003
- [4] SR Tool User Guide, 1vv0300899
- [5] 2006/771/EC, Harmonization of the radio spectrum for use by short-range devices
- [6] 2009/381/EC, Amending Decision 2006/771/EC on harmonization of the radio spectrum for use by short-range devices
- [7] Wireless M-Bus EN 13757-4:2010 User Guide 1vv0300953
- [8] EN 13757-4 : 2010 Draft of Wireless M-Bus Part 4, 2010



2. Requirements

2.1. General Requirements

The ME50-169 module is a multi-channel radio board, delivering up to 35 mW in the 169 MHz ISM band (unlicensed frequency band).

They are delivered with preloaded protocol stack:

- ME50-169: “Wireless M-Bus Part 4 Mode N” Protocol stack.

ME50-169 is pin-to-pin compatible with LE, NE and ME modules working at different frequencies.

ME50-169 is also pin-to-pin compatible with Telit ZE Family (ZigBee 2007 and ZigBee PRO stack).

2.2. 169 MHz band Requirements

The “ERC recommendation 70-03 Annex 2” describes the 169 MHz license free band for meter reading, in terms of bandwidth, maximum power, duty cycle and channel spacing. It gives the following limitations:

| ERC recommendation 70-03 | | | | |
|--------------------------|-----------------------------|------------------------------------|------------------------------|-----------------------|
| <i>Band</i> | <i>Frequency band (MHz)</i> | <i>Maximum radiated power (mW)</i> | <i>Channel spacing (kHz)</i> | <i>Duty cycle (%)</i> |
| 2b | 169.4 – 169.475 | 500 | Max 50 kHz | 10 |

These bands are free to use but the module and the user must respect some limitations. Most of these restrictions are integrated in the conception of the module, except the duty cycle. For example, the 2b band is limited to a 10% duty cycle. This means that each module is limited to a total transmit time of 6 minutes per hour. It is the responsibility of the user to respect the duty cycle.



National Restrictions for non specific SR devices Annex 2 band B:

| Country | Restriction | Reason/Remark |
|--------------------|------------------------|--|
| Band F | | |
| Austria | Not implemented | Planned |
| Belgium | No info | |
| Bulgaria | Not implemented | The band is used for national security needs |
| Croatia | Limited implementation | Individual licence required |
| Cyprus | | Cyprus has implemented Decision 2005/928/EC |
| Georgia | Not implemented | |
| Greece | Not implemented | |
| Norway | Limited | Maximum radiated power = 10 mW |
| Russian Federation | Not implemented | |
| The Netherlands | Implemented | Channel spacing 12.5 khz |
| Ukraine | Not implemented | Under study |

2.3. Other Requirements

Furthermore, the module complies with the ETSI 300-220-2 v2.3.1 standards (specific for SRD) which main requirements are described in Appendix 1. ME50-169 also complies which EN 13757-4 standards (Wireless M-Bus Part4).

Finally, the module complies with the new European Directive 2002/95/EC concerning the Restrictive Usage of Hazardous Substances (RoHS).

2.4. Functional Requirements

The ME50-169 module is a complete solution from serial interface to RF interface. The ME50-169 module has a digital part and a RF part. The radio link is a Half Duplex bi-directional link.

The digital part has the following functionalities:

- Communication interface
- I/O management
- Micro controller with embedded Telit Software Stack

The RF part has the following functionalities:

- Frequency synthesis
- Front-end
- Low noise reception
- Power amplification
- Packet handling



2.5. Software

The ME50-169 module is provided pre-flashed with one of the available Telit in-house Protocol Stack.

Please refer to Protocol Stack User Guides [7] for detailed information.

2.6. Temperature Requirements

| | <i>Minimum</i> | <i>Typical</i> | <i>Maximum</i> | <i>Unit</i> |
|--------------------------|----------------|----------------|----------------|-------------|
| <i>Operating</i> | | | | |
| Temperature | - 40 | 25 | + 85 | °C |
| Relative humidity @ 25°C | 20 | | 75 | % |
| <i>Storage</i> | | | | |
| Temperature | - 40 | 25 | + 85 | °C |



3. General Characteristics

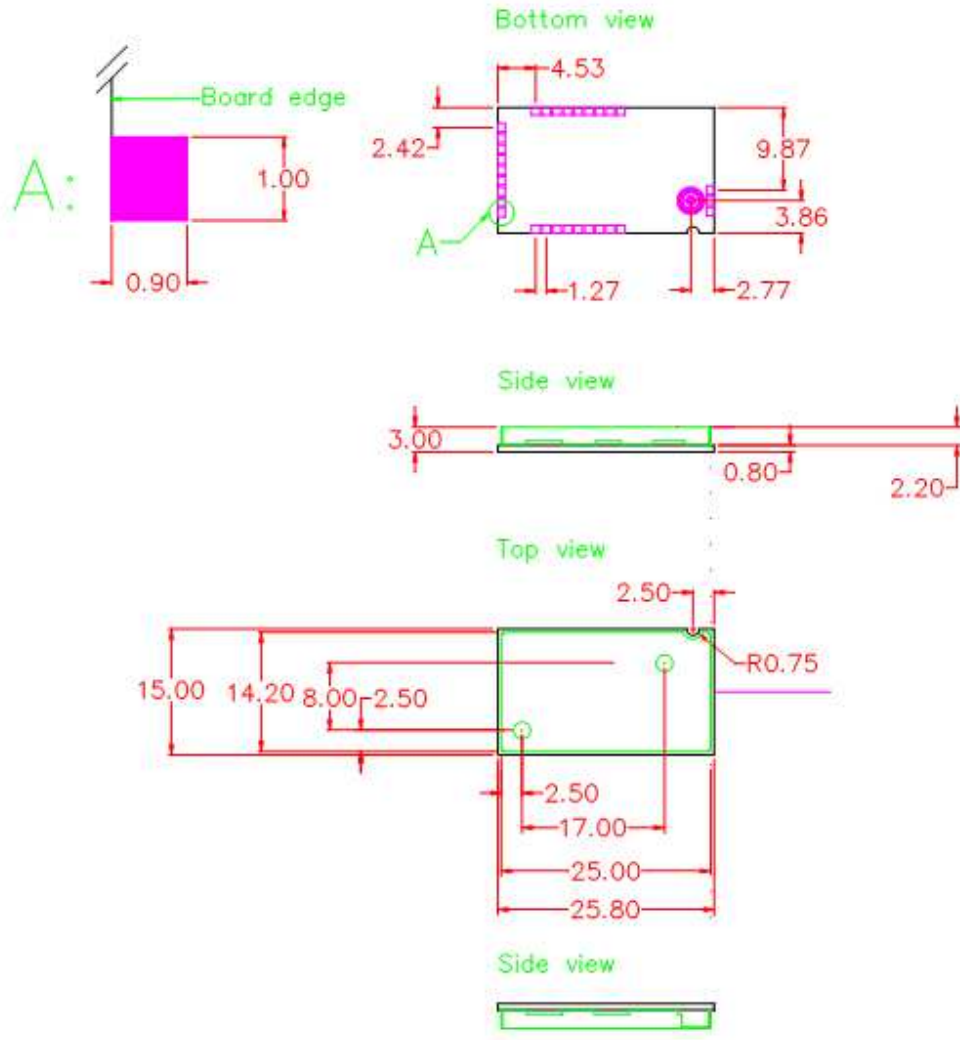
3.1. Mechanical Characteristics

| | |
|--------------------------------|---|
| <i>Size :</i> | Rectangular 25.8 x 15 mm |
| <i>Height :</i> | 3 mm |
| <i>Weight :</i> | 1.7 g |
| <i>PCB thickness:</i> | 0.8 mm |
| <i>Cover* :</i> | <ul style="list-style-type: none"> • Dimensions : 25 x 14.2 x 2.2mm • Thickness : 200µm |
| <i>Components :</i> | All SMD components, on one side of the PCB. |
| <i>Connectors :</i> | The terminals allowing conveying I/O signals are LGA |
| <i>Mounting :</i> | <ul style="list-style-type: none"> • SMD • LGA on the 4 external sides |
| <i>Number of pins :</i> | 30 |

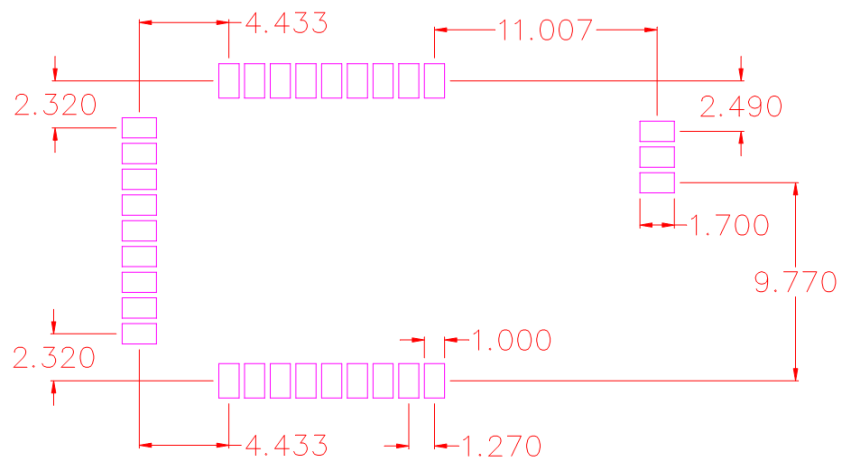
*: The metallic shield used on ME50-169 cover all the SMD components



3.2. Mechanical dimensions



3.3. Recommended Land pattern



3.4. DC Characteristics

Measured on DIP interface with T = 25°C, V_{dd} = 3V, 50 ohm impedance and default power register setting if nothing else noted.

Max limits apply over the entire operating range, T=-40°C to +85°C, V_{dd}=2V to 3.6V and all channels.

| Characteristics ME50-169 | Min. | Typ. | Max. |
|-----------------------------------|----------------------|-------------|----------------------|
| Power Supply (VDD): | +2.0V | +3.0V | +3.6V |
| Consumption | | | |
| Transmission: | | 64mA @ 30mW | |
| Reception : | | 33mA | |
| Stand-by (32.768 khz On) : | | <2.5µA | |
| Sleep (wake up on interruption) : | | <1µA | |
| I/O low level : | GND | - | 0.2x V _{DD} |
| I/O high level : | 0.8x V _{DD} | - | V _{DD} |



3.5. ME50-169 Functional Characteristics

Measured on DIP interface with T = 25°C, Vdd = 3V, 50 ohm impedance and default power register setting if nothing else noted.

| Global | | | | | | | |
|--|---|------------|------------|------------|------------|------------|---------------------|
| ERC Rec 70-03 Frequency Band | 169.4 – 169,475 Mhz | | | | | | |
| EN_13757-4 Channels | Channel 1a | Channel 1b | Channel 2a | Channel 2b | Channel 3a | Channel 3b | Channel 0 |
| Center frequency (Mhz) | 169,40625 | 169,41875 | 169,43125 | 169,44375 | 169,45625 | 169,46875 | 169,4375 |
| Channel width (kHz) | 12.5 | | | | | | 50 |
| RF data rate (Kbps) | 4.8 | | 2.4 | | 4.8 | | 38.4* |
| Transmission | | | | | | | |
| Duty cycle | ≤ 10% | | | | | | |
| Modulation Format | GMSK | | GFSK | | GMSK | | 4GFSK |
| Deviation (kHz) | +/- 1.2 | | +/- 2.4 | | +/- 1.2 | | -9.6,-3.2,+3.2,+9.6 |
| Frequency tolerance (kHz) | +/- 1.5 | | +/- 2.0 | | +/- 1.5 | | +/- 4.25 |
| RF Output Power | Selectable by software (see Protocol Stack User Guides [7]) | | | | | | |
| | Up to 30 mW @ 3.0 Volts | | | | | | |
| | Up to 35 mW @ 3.6 Volts | | | | | | |
| Max permitted e.r.p | 500 mW | | | | | | |
| Reception | | | | | | | |
| Rx BW (kHz) | 10 | | | | | | 40 |
| Measured Sensitivity for PER< 20% | -112 dBm | | -117 dBm | | -112 dBm | | -106 dBm |
| Min permitted Sensitivity for PER< 20% | -112 dBm | | -115 dBm | | -112 dBm | | -104 dBm |
| Saturation for PER< 20% | Up to +10 dBm under 50Ω | | | | | | |

*: The 38.4 kbps data rate may be modified by 19.2 kbps in the next evolution of the Wireless MBUS standard



| ETSI EN 300 220 V2.3.1 (2009-12) | | | | |
|---|---|--|---|--|
| Transmission | | | | |
| Frequency error | +/- 6.25 kHz @ 12.5 kHz channelization +/- 16.95 kHz (+/-100 ppm) > 25 kHz channelization | | | |
| ACP | - 37 dBm in 8.5 kHz BW under normal test conditions - 32 dBm in 8.5 kHz BW under extreme test conditions | | | |
| Modulation bandwidth | Reference Bandwidth (RBW) | Limit | Lower envelope point Minimum frequency | Upper envelope point maximum frequency |
| | 1 kHz | - 30 dBm (1 μ W) | $f_{e, lower}$ | $f_{e, upper}$ |
| | 1 kHz | - 36 dBm (250 nW) | ($f_{e, lower} - 200$ kHz) | ($f_{e, upper} + 200$ kHz) |
| | 10 kHz | - 36 dBm (250 nW) | ($f_{e, lower} - 400$ kHz) | ($f_{e, upper} + 400$ kHz) |
| | 100 kHz | - 36 dBm (250 nW) | ($f_{e, lower} - 1$ MHz) | ($f_{e, upper} + 1$ MHz) |
| Unwanted emissions in the spurious domain | Frequency | 47 MHz to 74 MHz 7,5 MHz to 118 MHz 174 MHz to 230 MHz 470 MHz to 862 MHz | Other frequencies below 1 000 MHz | Frequencies above 1 000 MHz |
| | State | | | |
| | Operating | - 54 dBm (4 nW) | - 36 dBm (250 nW) | - 30 dBm (1 μ W) |
| | Standby | - 57 dBm (2 nW) | - 57 dBm (2 nW) | - 47 dBm (20 nW) |
| Reception | | | | |
| Blocking for class 2 equipments | Frequency offset of the unwanted signal | Receiver bandwidth | | Minimum offset between wanted and unwanted signals |
| | +/-2 MHz | 10 kHz | | ≥ 37 dB |
| | | 40 kHz | | ≥ 31 dB |
| | +/-10 MHz | 10 kHz | | ≥ 62 dB |
| 40 kHz | | ≥ 56 dB | | |
| Spurious radiation | Below 1000 MHz | | Above 1000 MHz | |
| | - 57 dBm (2 nW) | | - 47 dBm (20 nW) | |



3.6. Digital Characteristic

| Function | Characteristics |
|--|---|
| µC | <ul style="list-style-type: none"> • 32 kB + 4 kB in system programmable flash • 4 kB RAM • 2 kB E²PROM |
| Serial link | <ul style="list-style-type: none"> • RS232 TTL Full Duplex • 1200 to 115200 bps • 7 or 8 bits • Parity management • Flow control <ul style="list-style-type: none"> ○ Hardware (RTS/CTS) |
| Embedded software functionality | <ul style="list-style-type: none"> • Flexibility: <ul style="list-style-type: none"> ○ Pre flashed ○ Customization capability ○ Download over the air |

3.7. Absolute Maximum Ratings

| | |
|---|--------------------------------|
| <i>Voltage applied to Vcc, V_{DD} :</i> | -0.3V to +3.6V |
| <i>Voltage applied to “TTL” Input :</i> | -0.3V to V _{DD} +0.3V |






3.8. Ordering Information

The following equipments can be ordered:

- The SMD version (ME50-169)
- The DIP interface version (ME50-169)
- The Demo Case (for ME50-169) composed by n.3 evaluation boards, n.3 DIP interface boards, RF antennas, serial cables, power supply / batteries.

The versions below are considered standard and should be readily available. For other versions, please contact Telit. Please make sure to give the complete part number when ordering.

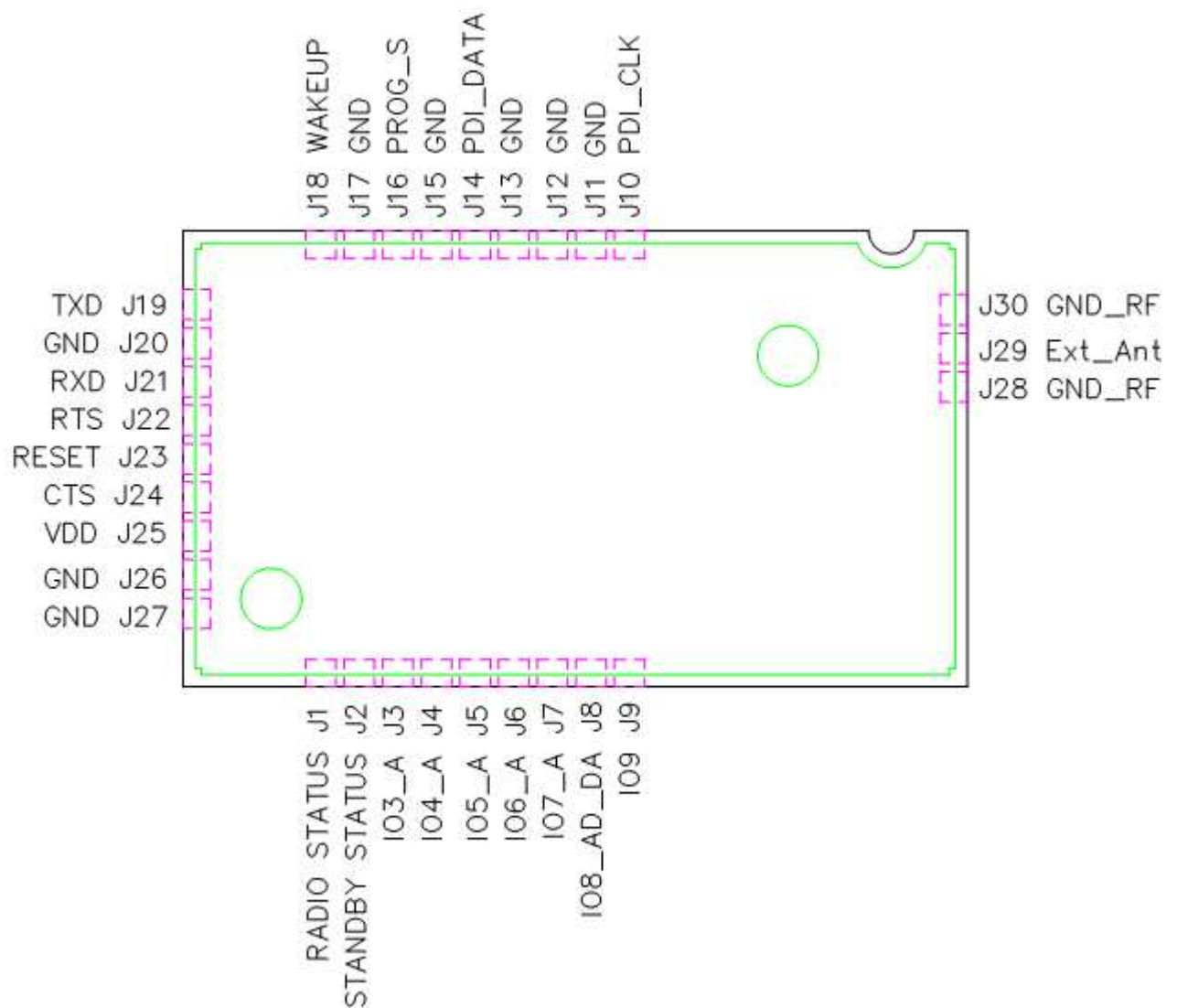


| |
|---|
| <i>Equipment and Part Number</i> |
| SMD Version |
| <i>B ME50-169/SMD</i> |
|  |
| DIP Version |
| <i>B ME50-169/DIP</i> |
|  |
| Demo Case |
| <i>D ME50-169/ Demo</i> |
|  |



4. Technical Description

4.1. Module Top View (cover side)



CAUTION: reserved pins must not be connected



CAUTION: In case you want to use in the same application Telit ZE51 or ZE61 modules J9 and J8 should not be connected, since reserved on these modules (see foot notes on Pin-Out tables).



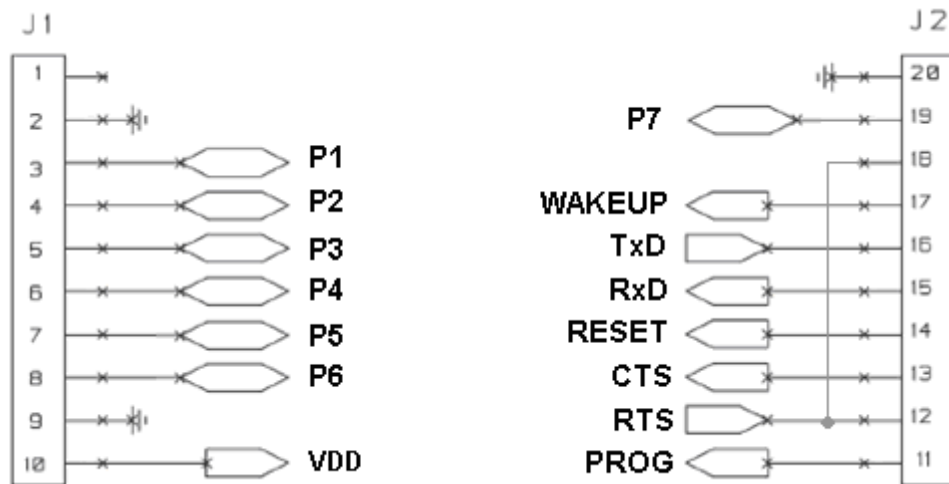
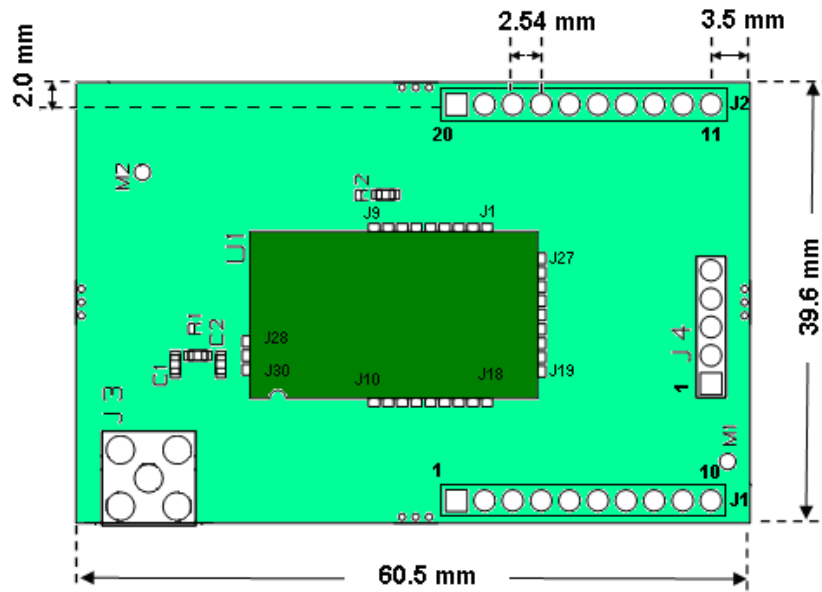
4.2. Pin-out of the module ME50-169

| <i>Pin</i> | <i>Pin name</i> | <i>Pin type</i> | <i>Signal level</i> | <i>Function</i> |
|------------|------------------------|-----------------|---------------------|---|
| J30 | GND | Gnd | | RF Ground connection for external antenna |
| J29 | Ext_Antenna | RF | | RF I/O connection to external antenna |
| J28 | GND | Gnd | | RF Ground connection for external antenna |
| J27 | GND | Gnd | | Ground |
| J26 | GND | Gnd | | Ground |
| J25 | VDD | Power | | Digital and Radio part power supply pin |
| J24 | CTS | I | TTL | Clear To Send |
| J23 | RESET | I | TTL | μ C reset (Active low with internal pull-up) |
| J22 | RTS | O | TTL | Request To Send |
| J21 | RXD | I | TTL | RxD UART – Serial Data Reception |
| J20 | GND | Gnd | | Ground |
| J19 | TXD | O | TTL | TxD UART – Serial Data Transmission |
| J18 | WAKEUP | I | TTL | Wake-up (Active high with internal pull-down: when set to 1 the module is awakened) |
| J17 | GND | Gnd | | Ground |
| J16 | PROG | I | TTL | Signal for serial μ C flashing (Active high with internal pull-down) |
| J15 | GND | Gnd | | Ground |
| J14 | PDI_DATA | I/O | TTL | Program and Debug Interface DATA |
| J13 | GND | Gnd | | Ground |
| J12 | GND | Gnd | | Ground |
| J11 | GND | Gnd | | Ground |
| J10 | PDI_CLK | I | TTL | Program and Debug Interface CLOCK |
| J9 | IO9 ¹ | I/O | TTL | Digital I/O N°9 with interrupt |
| J8 | IO8_AD_DA ² | I/O | analog | A to D and D to A I/O N°8 with interrupt (Logic I/O capability) |
| J7 | IO7_A | I/O | analog | Analog Input N°7 (Logic I/O capability) |
| J6 | IO6_A | I/O | analog | Analog Input N°6 (Logic I/O capability) |
| J5 | IO5_A | I/O | analog | Analog Input N°5 (Logic I/O capability) |
| J4 | IO4_A | I/O | analog | Analog Input N°4 (Logic I/O capability) |
| J3 | IO3_A | I/O | analog | Analog Input N°3 (Logic I/O capability) |
| J2 | STANDBY STATUS | O | TTL | Signal indicating stand-by status |
| J1 | RADIO STATUS | O | TTL | Signal indicating reception or transmission of radio frame |

^{1,2} In case you want to use in the same application Telit ZE51 or ZE61 modules J9 and J8 should not be connected, since reserved on these modules.



4.3. Pin-out of the DIP Module



4.4. Pin-out correspondence table

Pin-Out correspondence between ME50-169/DIP and ME50-169/SMD.

| ME50-169/DIP | | | ME50-169/SMD | | Comments |
|---------------|---------------|------|--------------|-----------------------------|---|
| Connector | Pin | Name | Pin | Pin Name | |
| J1 | 1 | | | | |
| | 2 | | | GND | |
| | 3 | P1 | J5 | IO5_A | |
| | 4 | P2 | J9 | IO9_I | Reserved Pin |
| | 5 | P3 | J2 | STANDBY STATUS | |
| | 6 | P4 | J1 | RADIO STATUS | |
| | 7 | P5 | J4 | IO4_A | |
| | 8 | P6 | J3 | IO3_A | |
| | 9 | | | GND | |
| | 10 | | J25 | VDD | |
| J2 | 11 | | J16 | PROG | |
| | 12 | | J22 | RTS | |
| | 13 | | J24 | CTS | |
| | 14 | | J23 | RESET | |
| | 15 | | J21 | RxD | |
| | 16 | | J19 | TxD | |
| | 17 | | J18 | WAKEUP | |
| | 18 | | J22 | RTS | |
| | 19 | P7 | J6 | IO6_A | |
| | 20 | | | GND | |
| J4 | 1 | | J14 | PDI_DATA | J4 Connector for debugging and flashing |
| | 2 | | J10 | PDI_CLK | |
| | 3 | | J23 | RESET | |
| | 4 | | J25 | VDD | |
| | 5 | | | GND | |
| | | | J7 | IO7_A | |
| | | | J8 | IO8_AD_DA | Reserved Pin |
| RF connection | | | | | |
| J3 | SMA connector | | J29 | Ext_Antenna (Unbalanced RF) | A 50 Ohm coplanar wave guide and a matching network connect J29 to J3 |



4.5. Description of the signals

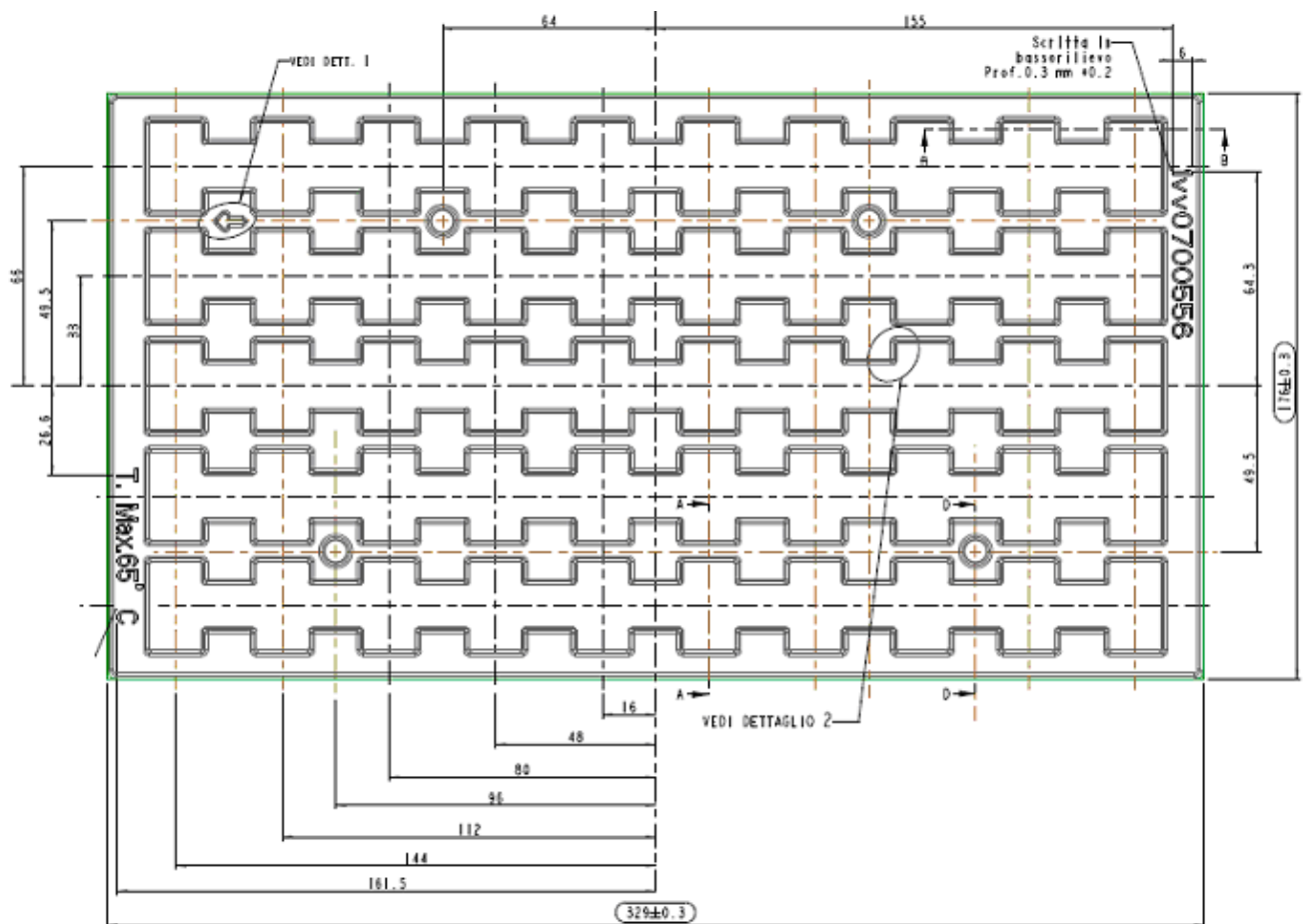
| Signals | Description |
|-----------------------|---|
| RESET | External hardware reset of the radio module. Active on low state. |
| TXD, RXD | Serial link signals, format NRZ/TTL: TXD is for outgoing data. RXD is for incoming data. The '1' is represented by a high state. |
| CTS | Incoming signal. Indicates whether the module can send serial data to user (Active, on low state) or not (inactive, on high state). |
| RTS | Outgoing signal. Indicates whether the user can transmit serial data (active, on low state) or not (inactive, on high state). |
| IO | I/O, configurable as input or as output. |
| WAKEUP | Input signal which indicates to the module to wake up from low-power mode. See reference document [7] for ME50-169 |
| RADIO STATUS | Output signal which indicates the status of the radio. Set to VCC during radio transmission or as soon as a radio frame is detected with correct synchronization word. The signals returns to GND at the end of transmission or as soon as the frame reception is finished. |
| STANDBY STATUS | The 'STAND BY STATUS' output signal is set to logical '1' while the module is operating and return to '0' during stand by periods. |



5. Process Information

5.1. Delivery

ME50-169 modules are delivered in plastic tray packaging, each tray including 50 units. The dimensions of the tray are the following: 329 mm x 176 mm x 5.6 mm. Each unit is placed in a 26.6 mm x 16 mm location. An empty tray weights 45 g and a loaded tray weights around 130 g.



5.2. Storage

The optimal storage environment for ME50-169 modules should be dust free, dry and the temperature should be included between -40°C and +85°C.

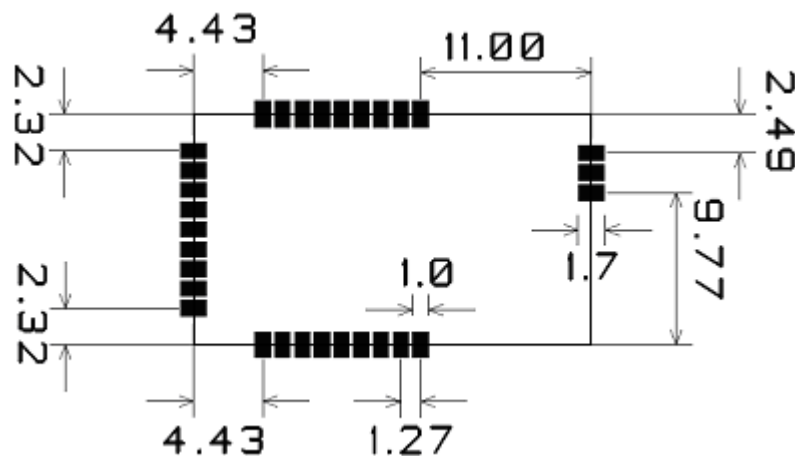
In case of a reflow soldering process, ME radio modules must be submitted to a drying bake at +60°C during 24 hours. The drying bake must be used prior to the reflow soldering process in order to prevent a popcorn effect. After being submitted to the drying bake, ME modules must be soldered on host boards within 168 hours.

Also, it must be noted that due to some components, ME50-169 modules are ESD sensitive device. Therefore, ESD handling precautions should be carefully observed..

5.3. Soldering pad pattern

The surface finished on the printed circuit board pads should be made of Nickel/Gold surface.

The recommended soldering pad layout on the host board for the ME50-169 is shown in the diagram below:



All dimensions in mm

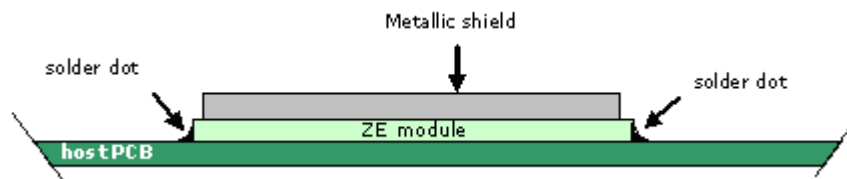
Neither via-holes nor wires are allowed on the PCB upper layer in area occupied by the module.



5.4. Solder past

ME50-169 module is designed for surface mounting using half-moon solder joints (see diagram below). For proper module assembly, solder paste must be printed on the target surface of the host board. The solder paste should be eutectic and made of 95.5% of SN, 4% of Ag and 0.5% of Cu. The recommended solder paste height is 180 μm .

The following diagram shows mounting characteristics for ME integration on host PCB:



5.5. Placement

The ME50-169 module can be automatically placed on host boards by pick-and-place machines like any integrated circuit

5.6. Soldering Profile (RoHS Process)

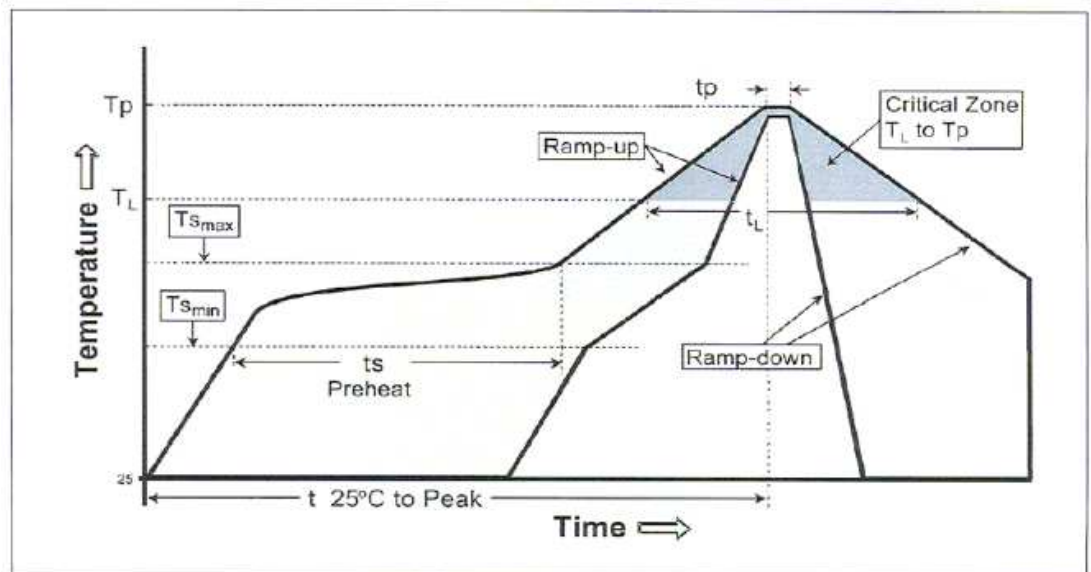
It must be noted that ME50-169 module should not be allowed to be hanging upside down during the reflow operation. This means that the module has to be assembled on the side of the printed circuit board that is soldered last.

The recommendation for lead-free solder reflow in IPC/JEDEC J-STD-020D Standard should be followed.



| Profile Feature | Sn-Pb Eutectic Assembly | Pb-Free Assembly |
|--|-------------------------|-----------------------|
| Average Ramp-UP Rate (Ts max to Tp) | 3°C/second max. | 3°C/second max. |
| Preheat | | |
| - Temperature Min (Ts min) | 100°C | 150°C |
| - Temperature Max (Ts max) | 150°C | 200°C |
| - Time (ts min to ts max) | 60 - 120 seconds | 60 - 120 seconds |
| Time maintained above: | | |
| - Temperature (TL) | 183°C | 221°C |
| - Time (tL) | 35 - 90 seconds | 45 - 90 seconds |
| Peak/Classification Temperature (Tp) | max. Peak Temp. 225°C | max. Peak Temp. 260°C |
| Time within 5°C of actual Peak Temperature (tp) | 10 - 30 seconds | 10 seconds |
| Ramp-Down Rate | 4°C/second max. | 4°C/second max. |
| Time 25°C to Peak Temperature | 6 minutes max. | 8 minutes max. |
| Minimum Solderjoint Peak-Temperature | | 235°C/ 10sec. |

Note 1: All temperatures refer to topside of the package, measured on the package body surface.



The barcode label located on the module shield is able to withstand the reflow temperature.



CAUTION - It must also be noted that if the host board is submitted to a wave soldering after the reflow operation, a solder mask must be used in order to protect the ME50-169 radio module's metal shield from being in contact with the solder wave.



6. Board Mounting Recommendation

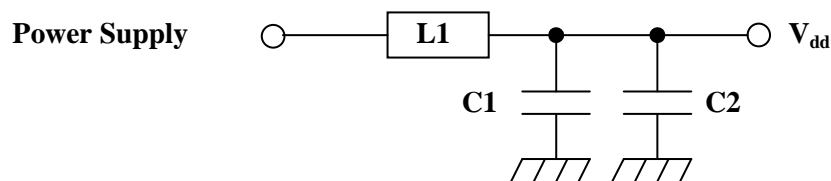
6.1. Electrical environment

The best performances of the ME50-169 module are obtained in a “clean noise” environment. Some basic recommendations must be followed:

- Noisy electronic components (serial RS232, DC-DC Converter, Display, Ram, bus ,...) must be placed as far as possible from the ME50-169 module.
- Switching components circuits (especially RS-232/TTL interface circuit power supply) must be decoupled with a 100 μ F tantalum capacitor. And the decoupling capacitor must be as close as possible to the noisy chip.

6.2. Power supply decoupling on ME50-169 module

The power supply of ME50-169 module must be nearby decoupled. A LC filter must be placed as close as possible to the radio module power supply pin, VDD .



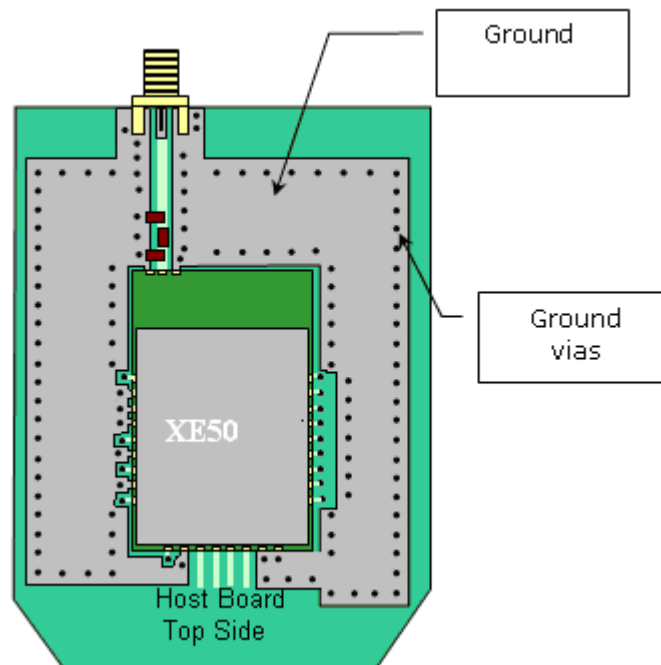
| Symbols | Reference | Value | Manufacturer |
|---------|-------------------|------------|--------------|
| L1 | LQH31MN1R0K03 | 1 μ H | Murata |
| C1 | GRM31CF51A226ZE01 | 22 μ F | Murata |
| C2 | Ceramic CMS 25V | 100nF | Multiple |



6.3. RF layout considerations

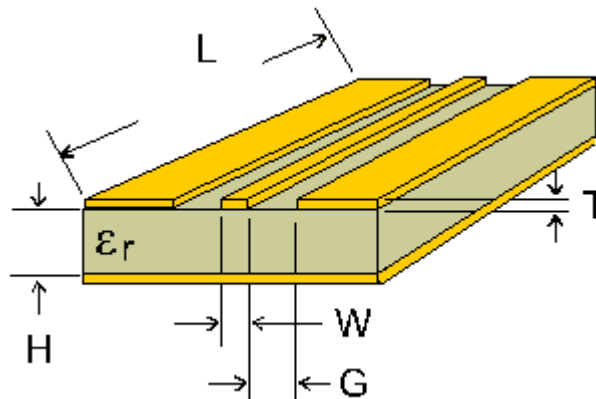
Basic recommendations must be followed to achieve a good RF layout :

- It is recommended to fill all unused PCB area around the module with ground plane
- The radio module ground pin must be connected to solid ground plane.
- If the ground plane is on the bottom side, a via (Metal hole) must be used in front of each ground pad. Especially J28 and J30 (RF Gnd) pins should be grounded via several holes to be located right next to the pins thus minimizing inductance and preventing mismatch and losses.



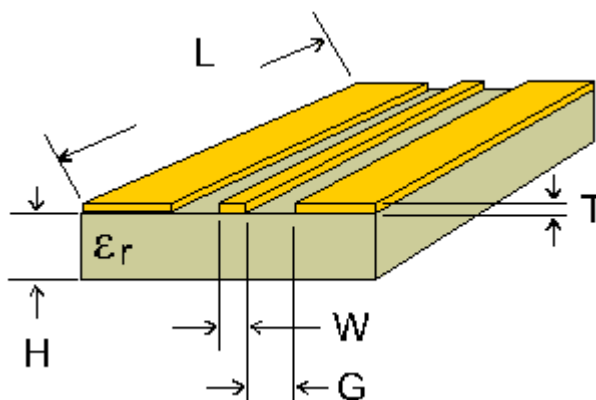
6.4. Antenna connections on printed circuit boards

Special care must be taken when connecting an antenna or a connector to the module. The RF output impedance is 50 ohms, so the strip between the pad and the antenna or connector must be 50 ohms following the tables below. Ground lines should be connected to the ground plane with as many vias as possible, but not too close to the signal line.



| PCB material | PCB thickness H (mm) | Coplanar line W (mm) | Coplanar line G (mm) |
|--------------|----------------------|----------------------|----------------------|
| FR4 | 0.8 | 1 | 0.3 |
| | 1.6 | 1 | 0.2 |

Table 1 : Values for double face PCB with ground plane around and under coplanar wave guide (recommended)



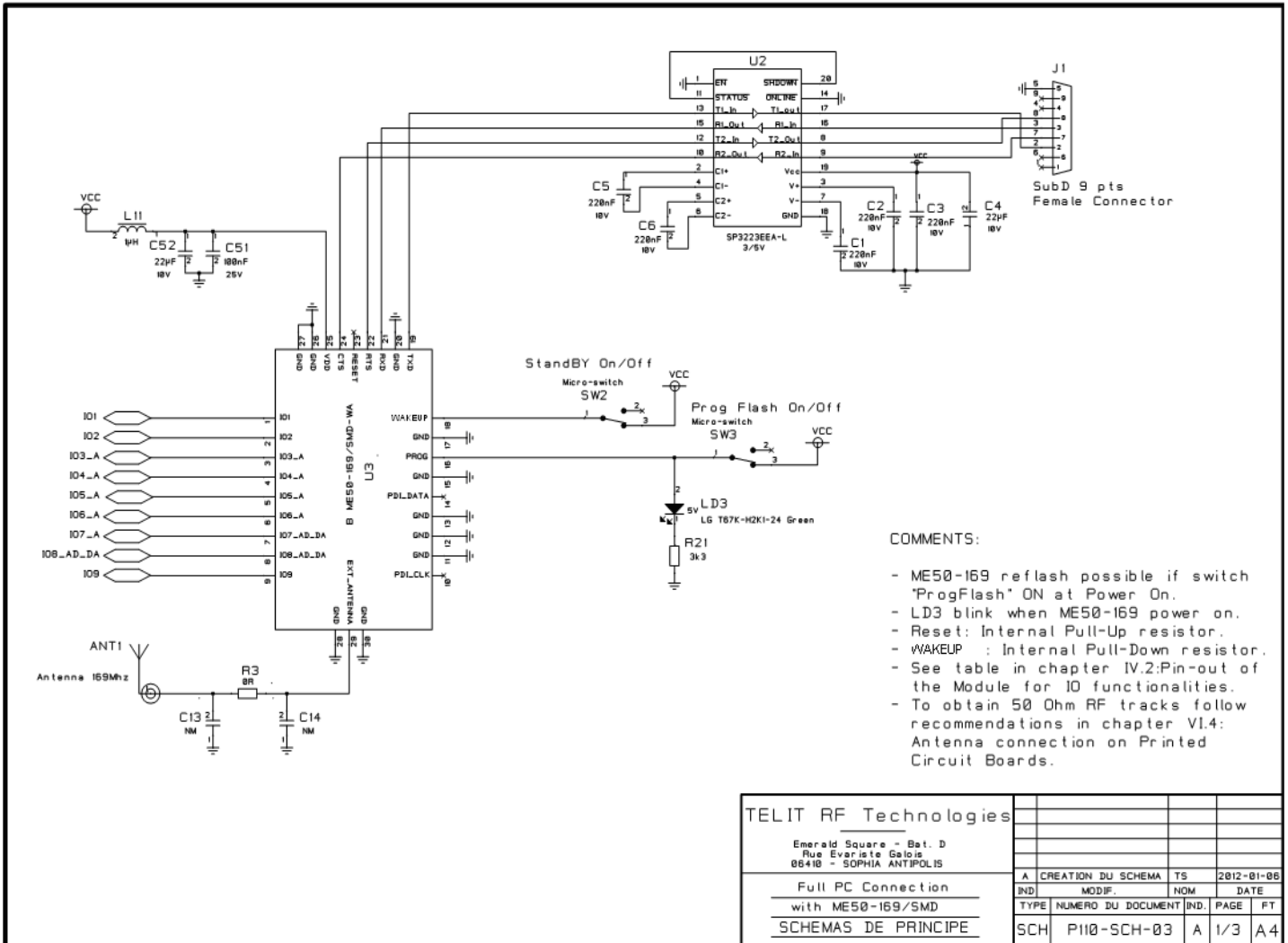
| PCB material | PCB thickness H (mm) | Coplanar line W (mm) | Coplanar line G (mm) |
|--------------|----------------------|----------------------|----------------------|
| FR4 | 0.8 | 1 | 0.22 |
| | 1.6 | 1 | 0.23 |

Table 2 : Values for simple face PCB with ground plane around coplanar wave guide (not recommended)

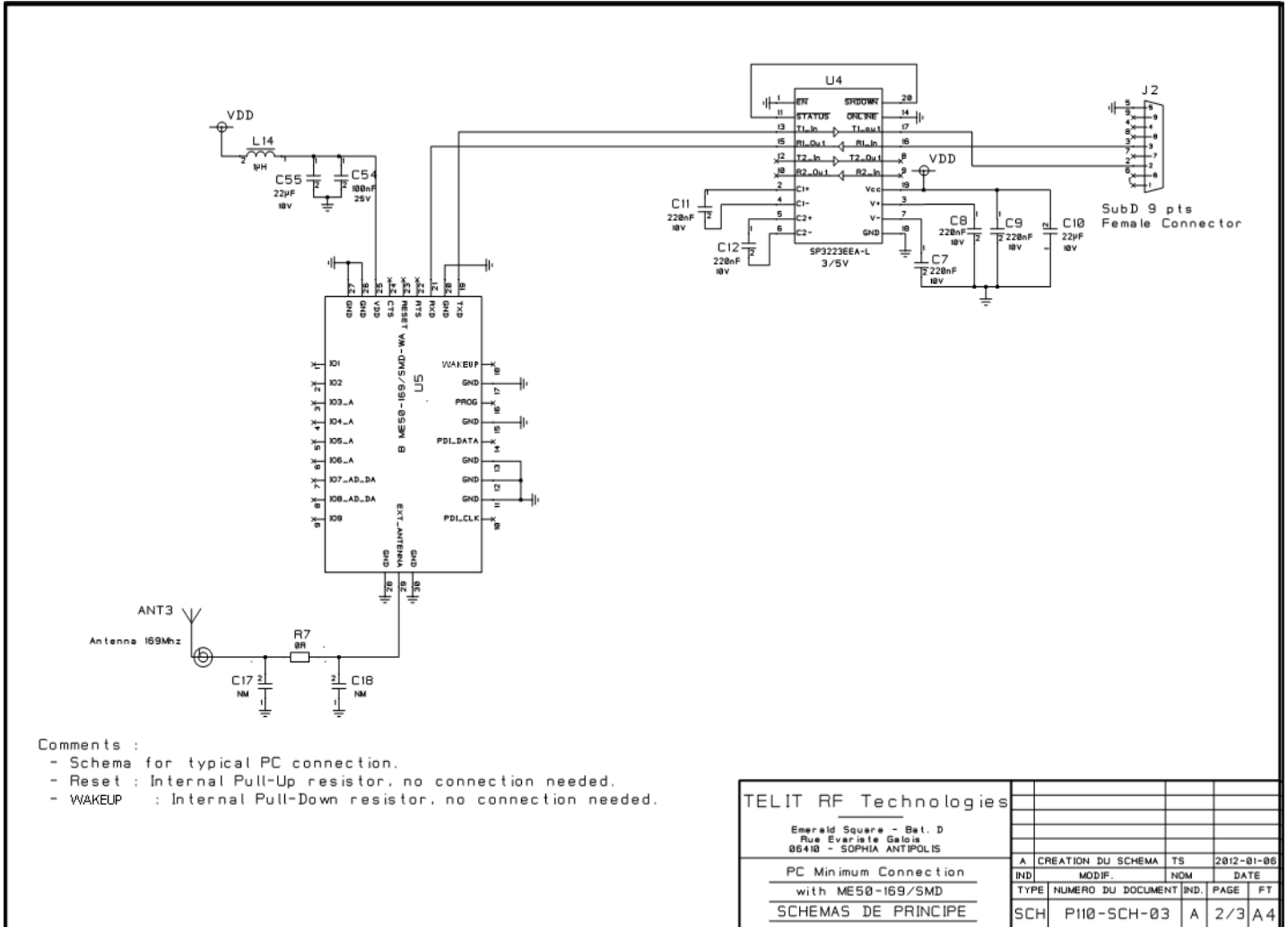


6.5. ME50-169 Interfacing

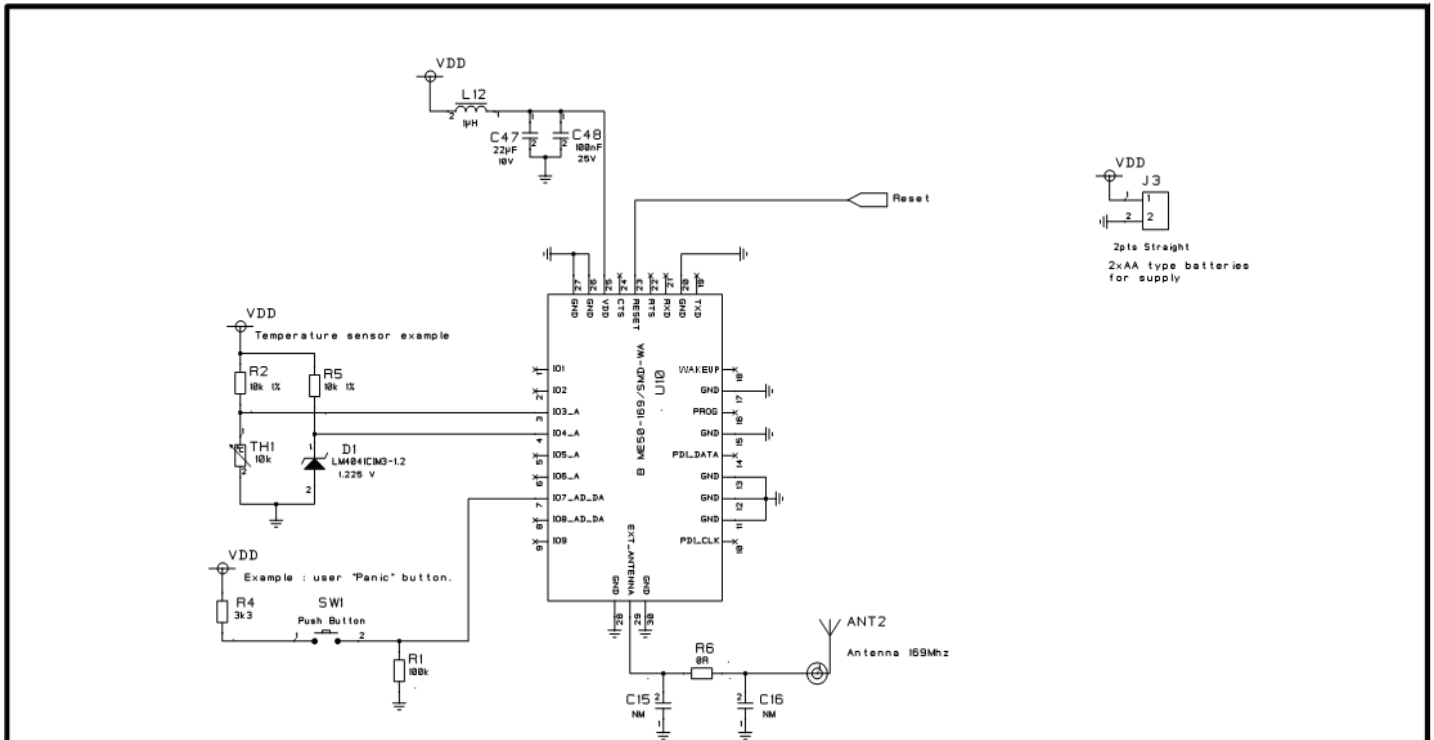
Example of a full RS-232 connection between a PC or an Automat (PLC) and ME50-169



Example of a minimum PC connection with ME50-169 .



Example for sensor connection with ME50-169.




- Comments :
- Schema for sensor connexion.
 - Reset : Internal Pull-Up resistor.
 - WAKEUP : Internal Pull-Down resistor.
 - IO7_A: Logic Input/Output (0 to Vdd) with interrupt.
 - IO3_A & IO7_A : Analog Input. 12 bits precision.

| | | | | | | | |
|--|--|--|--|------|--------------------|------|------------|
| TELIT RF Technologies | | | | | | | |
| Emerald Square - Bat. D Rue Evariste Galois 06410 - SOPHIA ANTIPOLIS | | | | | | | |
| Thermostat example with ME50-169/SMD | | | | A | CREATION DU SCHEMA | TS | 2012-01-06 |
| SCHEMAS DE PRINCIPE | | | | IND | MODIF. | NOM | DATE |
| | | | | TYPE | NUMERO DU DOCUMENT | IND. | PAGE FT |
| | | | | SCH | P110-SCH-03 | A | 3/3 A4 |



7. EC Declaration of Conformity





EC DECLARATION OF CONFORMITY

1. ME50-169 (product name)

2. Telit Communications S.p.A -loc. Sa Illetta, S.S. 195, Km 2.300, 09122 Cagliari- ITALY (manufacturer)

3. This declaration of conformity is issued under the sole responsibility of the manufacturer

4. Short Range Radio Module for Application in 169 MHz band

5. The object of the declaration described above is in conformity with the relevant Community harmonisation:
European Directive 1999/05/EC (R&TTE)

6. The conformity with the essential requirements of the 1999/05/EC has been demonstrated against the following harmonized standards:


| | |
|---|--|
| EN 60950-1:2006 + CORR:2006 + A11:2009 + A1:2010 + A12:2011 + AC:2011 | For article 3.1 (a): Health and Safety of the User |
| EN 301 489-1 V1.9.2 EN 301 489-3 V1.4.1 | For article 3.1 (b): Electromagnetic Compatibility |
| EN 300 220-2 V2.4.1 | For article 3.2: Effective use of spectrum allocated |


7. The conformity assessment procedure referred to in Article 10, and detailed in Annex V of Directive 1999/05/EC has been followed with the involvement of the following Notified Body:
CETECOM ICT Services GmbH Untertürkheimer Straße 6-10, D-66117 Saarbrücken, Germany.
Notified Body Number: 0682

Thus, **CE 0682** is placed on the product

8. The Technical Construction File (TCF) relevant to the product described above, and which supports this Declaration of Conformity, is held at: Telit Communications S.p.A, Via Stazione di Prosecco, 5/b - 34010 Sgonico (TRIESTE) ITALY

Signed for and on behalf of Telit Communications S.p.A.
Trieste, **2013-07-11**


 EMEA Quality Director
 Guido Waicher


 R&D Manager
 Gianpiero Pili

Technical Construction File : J03967CF0036a_rev0

Mod 0211 2012-11 Rev.2 (76A/2008/EC)



8. 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. 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 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 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 of 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 equipments introduced on the market. All the relevant information's are available on the European Community website:

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

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

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



9. Glossary

| | |
|--------------------------|--|
| ACP | Adjacent Channel Power |
| AFA | Adaptive Frequency Agility |
| bps | Bits per second |
| BW | Bandwidth |
| dB | Decibel |
| dBm | Power level in decibel milliwatt ($10 \log (P/1mW)$) |
| E²PROM | Electrically Erasable Programmable Read Only Memory |
| e.r.p | Effective radiated power |
| ETSI | European Telecommunication Standard Institute |
| GFSK | Gaussian Frequency Shift Keying |
| I | Input |
| ISM | Industrial, Scientific and Medical |
| kB | KiloByte |
| kbps | Kilobits per second |
| kcps | Kilochips per second |
| kHz | Kilo Hertz |
| LBT | Listen Before Talk |
| LGA | Land Grid Array |
| MHz | Mega Hertz |
| mW | milliwatt |
| O | Output |
| PER | Packet Error Rate |
| ppm | Parts per million |
| RAM | Random Access Memory |
| RF | Radio Frequency |
| RoHS | Restriction of Hazardous Substances |
| RxD | Receive Data |
| SMD | Surface Mounted Device |
| SRD | Short Range Device |
| TxD | Transmit Data |
| UART | Universal Asynchronous Receiver Transmitter |
| μC | microcontroller |



10. Document History

| Revision | Date | Changes |
|----------|------------|--|
| 0 | 2011-01-03 | First release |
| 1 | 2011-01-24 | <ul style="list-style-type: none"> Removed 3.6 |
| 2 | 2012-03-14 | <ul style="list-style-type: none"> Updated J18 Pin signal description in 4.2 Corrected 4.5 Corrected 6.5 Removed 7 |
| 3 | 2013-11-06 | <ul style="list-style-type: none"> Inserted EC Declaration of Conformity |

