

WLn-LINK-OEM HARDWARE MANUAL



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|  <p>10, rue des Entrepreneurs Z.A. Val Joyeux 78450 VILLEPREUX - France</p> | <p>Phone: +33 (0)1 30 56 46 46 Fax: +33 (0)1 30 56 12 95 Web site: www.acksys.fr Hotline: support@acksys.fr Sales: sales@acksys.fr</p> |
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I INTRODUCTION

This hardware documentation applies to the following products:

- WLn-LINK-OEM-RJ (100mW radio card, 3T/3R, 2 streams, -20 +70°C)
- WLn-LINK-OEM-RJ/3 (400mW radio card, 3T/3R, 2 streams, -40 +75°C)

- WLn-LINK-OEM-TTL (100mW radio card, 3T/3R, 2 streams, -20 +70°C)
- WLn-LINK-OEM-TTL/3 (400mW radio card, 3T/3R, 2 streams, -40 +75°C)

Together with the "WLn products user guide (ref DTUS065)", it covers product installation, configuration and usage, and general information about Wi-Fi protocols.

This hardware manual describes equipment installation, such as power supplies, dimensions and connectors.

The "WLn products user guide DTUS065" describes the configuration and use of the equipment.

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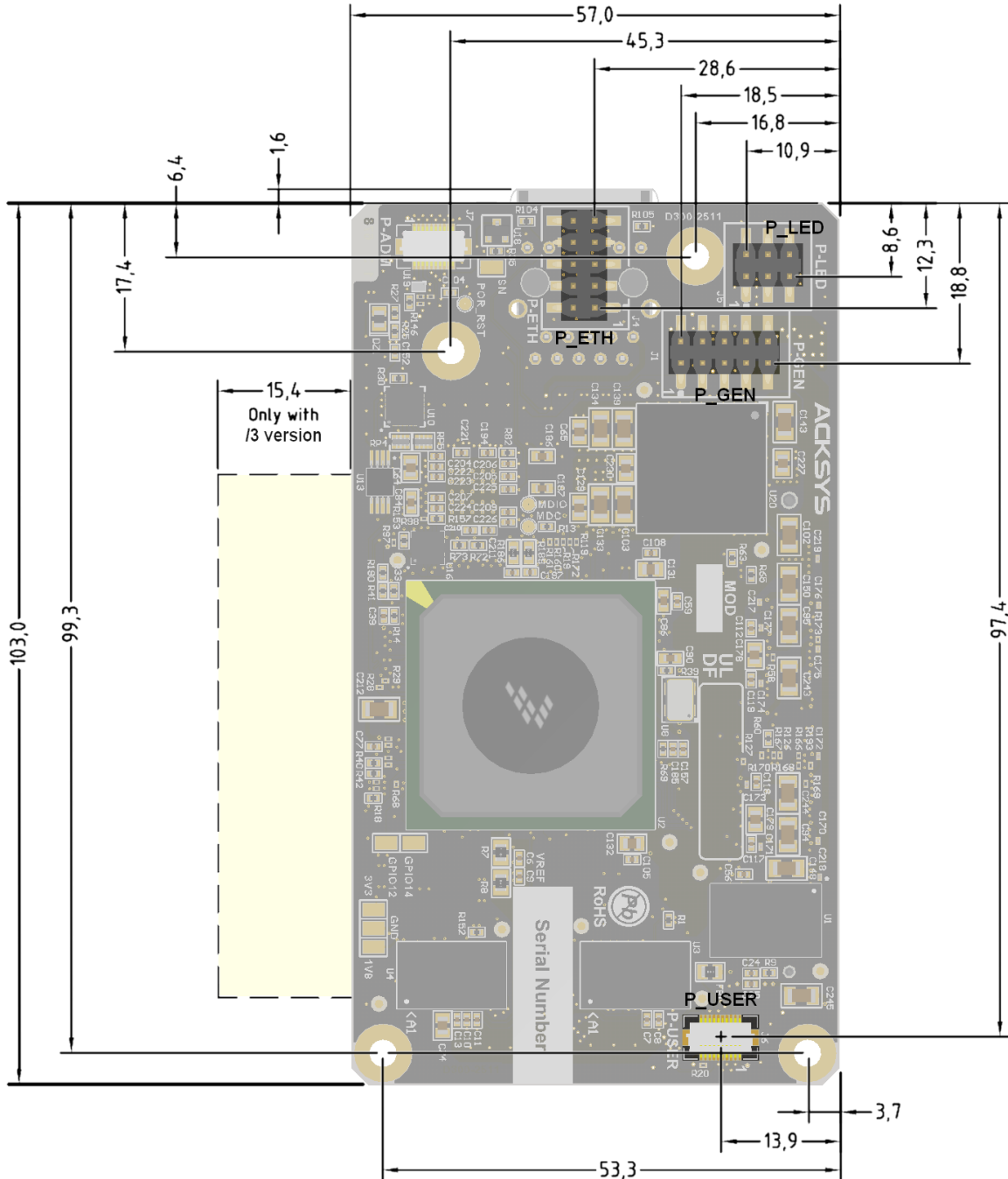
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II MECHANICAL DIMENSIONS

II.1 Bottom view

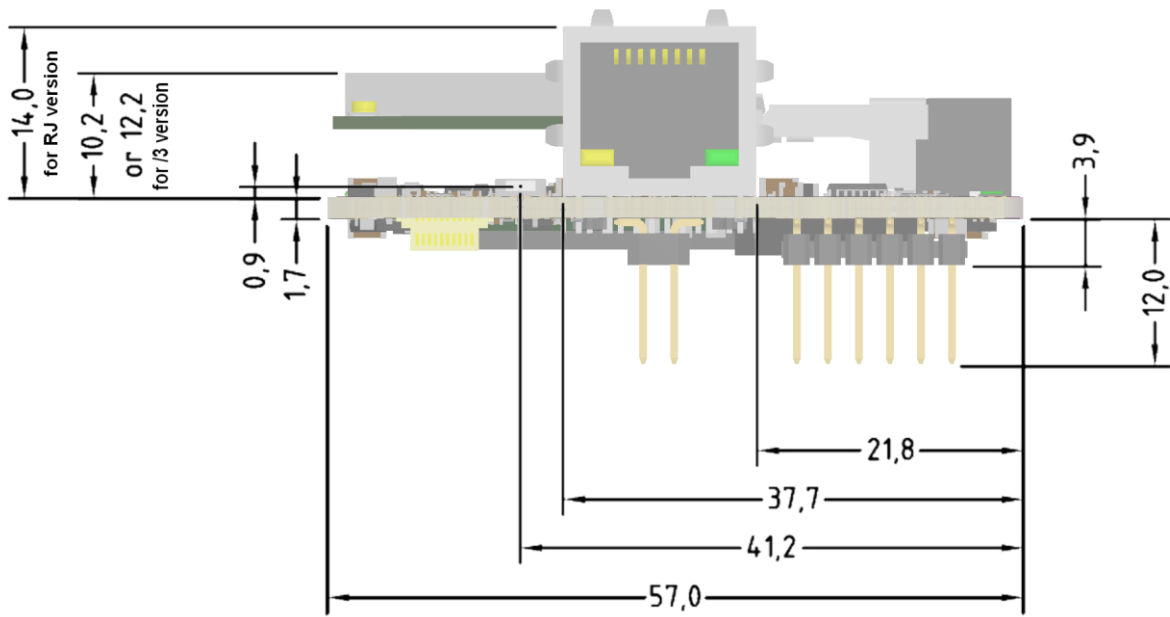
All dimensions in mm ± 0.1



Mounting holes : 4 x Ø3.2mm

II.2 Front view

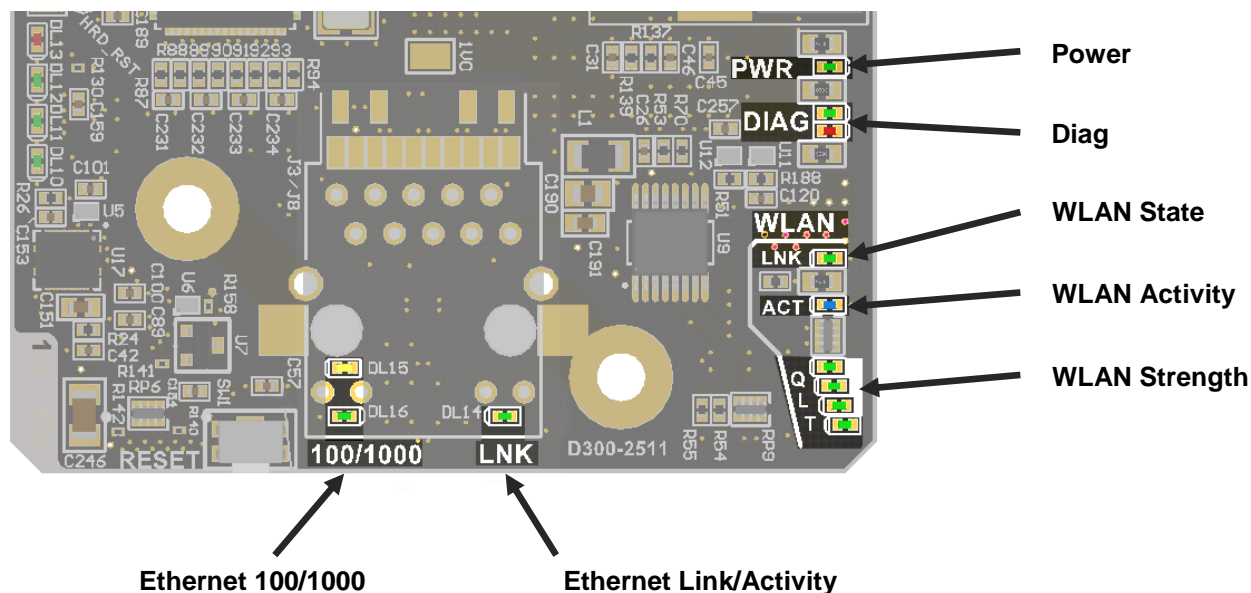
All dimensions in mm ± 0.1



III LEDS AND BUTTON

III.1 Leds

The leds and the button are directly available on the WLn-LINK-OEM:



III.2 Signals relocation

All the leds and button are also made available to the host motherboard via the P-GEN and P-LED connectors (see information in the following chapters) in order to be used in your own way.

III.2.1 Power

GREEN while powered on

III.2.2 Diag

GREEN when product is OK and initialized

RED during initialization (~ 40 seconds)

Flashing when firmware in flash is not valid

OFF or RED for more than 2min: Hardware failure

III.2.3 WLAN State

Fixed GREEN when associated with another Wi-Fi product

Flashing GREEN when unassociated

III.2.4 WLAN Activity

Flashing BLUE when there is activity on WLAN (sending or receiving) or during the search for a Wi-Fi access point (only in "Bridge Mode")

III.2.5 WLAN Strength

Only available in "Bridge Mode" (4 leds OFF in "Access Point Mode")

4 leds GREEN to indicate the strength of Wi-Fi signal:

- 4 ON : Excellent signal
- 1 ON : Poor signal

During initialization, these leds flash one after other to indicate the start of the product.

III.2.6 Ethernet 100/1000

OFF when Ethernet connection is negotiated in **10** MBit/s

GREEN when Ethernet connection is negotiated in **100** MBit/s

YELLOW when Ethernet connection is negotiated in **1000** MBit/s

Available at the same location either directly on the board (for TTL version) or on the RJ connector (for RJ version)

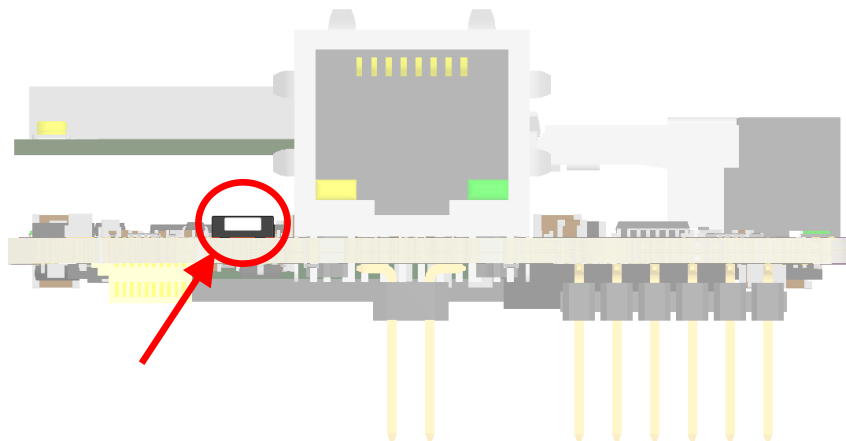
III.2.7 Ethernet Link/Activity

Fixed GREEN when link is established with another Ethernet product

Flashing GREEN when there is activity on Ethernet (sending or receiving)

Available at the same location either directly on the board (for TTL version) or on the RJ connector (for RJ version)

III.3 Reset



The Reset button allows you to re-start the product or reconfigure it to default factory settings (see "WLn products user guide DTUS065" for more information)

IV EVALUATION BOARD

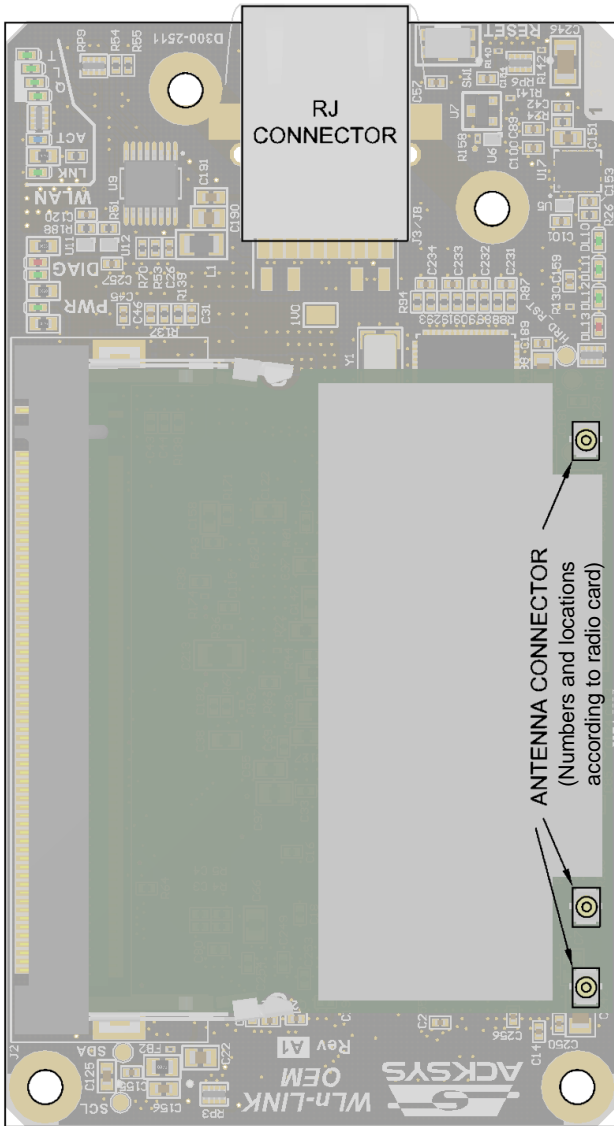
In order to evaluate this module, you can use the WLn-LINK-OEM-EVAL :



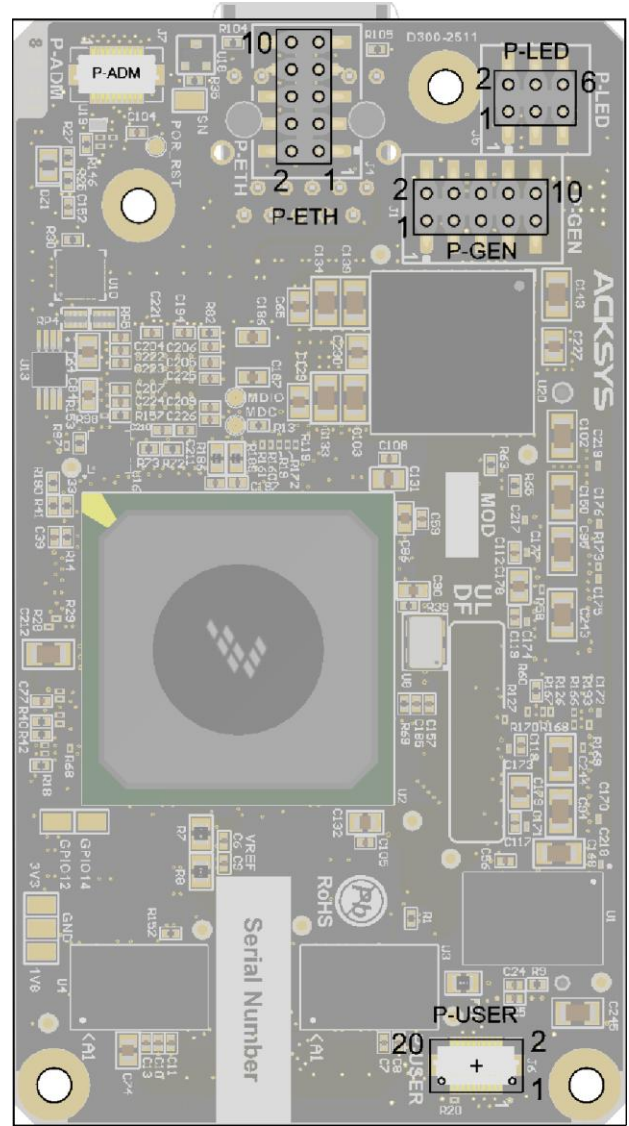
The "Quick start for WLn-LINK-OEM-EVAL - DTFRUS050" describes the configuration and use of this equipment.

V WIRING CONNECTORS

V.1 Pinout



Top view



Bottom view

"Fixation pads" are isolated from GND

V.2 P-GEN

HE10/HE13/HE14/Strip Male Header 2.54mm pitch, 2x5 pins

- Compatible with HE10/HE13/HE14 Female Receptacle
(ex: SAMTEC Series BCS, BSW, ESQ, ESW...)
(ex: ANTELEC Series APC104, FT2...)

| Pin | In/ Out | Function | Voltage | Max current |
|------|------------|---|----------------------------------|--|
| 1 | Out | LED Ethernet 100 BaseT | active at 3.3V | 2 mA |
| 2 | Out | 1V8 (for feeding the Ethernet transformer on the TTL version) | <i>not for power use</i> | - |
| 3 | Out | LED Ethernet Link/Activity | active at 0V | 2 mA |
| 4 | Out | LED WLAN Activity | active at 0V | 15 mA |
| 5 | Out | LED Diag | active at 3.3V | 5 mA |
| 6 | In | Reset | active at 3.3V | 20 μ A |
| 7,9 | In | Power +5V | +5V \pm 0.25 | 2A with normal version 2.5A with /3 version |
| 8,10 | - | Power GND | 0V | |

WARNING : You must take care of the polarity of the power supply source. There is no protection on this product.

V.3 P-LED

HE10/HE13/HE14/Strip Male Header 2.54mm pitch, 2x3 pins

- Compatible with HE10/HE13/HE14 Female Receptacle
(ex: SAMTEC Series BCS, BSW, ESQ, ESW...)
(ex: ANTELEC Series APC104, FT2...)

| Pin | Function | Voltage | Max current |
|-----|---|----------------|-------------|
| 1 | LED Ethernet 1000 BaseT | active at 3.3V | 2 mA |
| 2 | LED WLAN Status | active at 0V | 15 mA |
| 3 | LED WLAN Bargraph level 3 <i>good signal</i> | active at 0V | 15 mA |
| 4 | LED WLAN Bargraph level 2 <i>medium signal</i> | active at 0V | 15 mA |
| 5 | LED WLAN Bargraph level 4 <i>excellent signal</i> | active at 0V | 15 mA |
| 6 | LED WLAN Bargraph level 1 <i>poor signal</i> | active at 0V | 15 mA |

When one WLAN quality bargraph led is on, all the lesser-quality leds are also on (this is a software feature).

V.4 RJ CONNECTOR

LAN-Transformer RJ45 10/100/1000 BaseT

Only available with RJ version

It allows connecting a classical Ethernet cable (*cat 5e* or *cat 6* for 1000 BaseT)

V.5 P-ETH

HE10/HE13/HE14/Strip Male Header 2.54mm pitch, 2x5 pins

Only available with TTL version

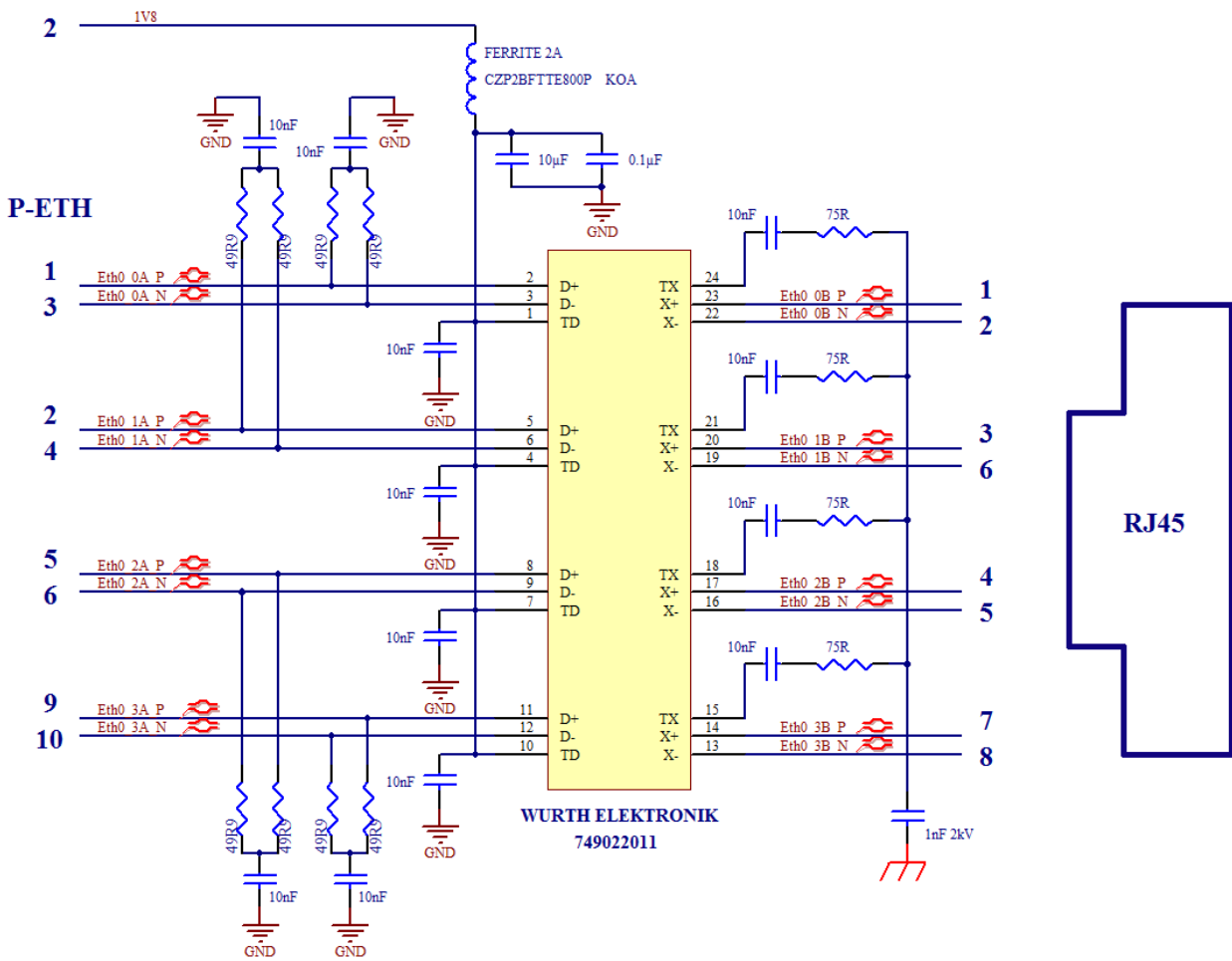
- Compatible with HE10/HE13/HE14 Female Receptacle
(ex: SAMTEC Series BCS, BSW, ESQ, ESW...
ANTELEC Series APC104, FT2...)

This connector gives directly raw signals from the Ethernet PHY component, without insulation. The PHY used on the WLn-LINK-OEM-TTL is *88E1118* from *Marvell*.

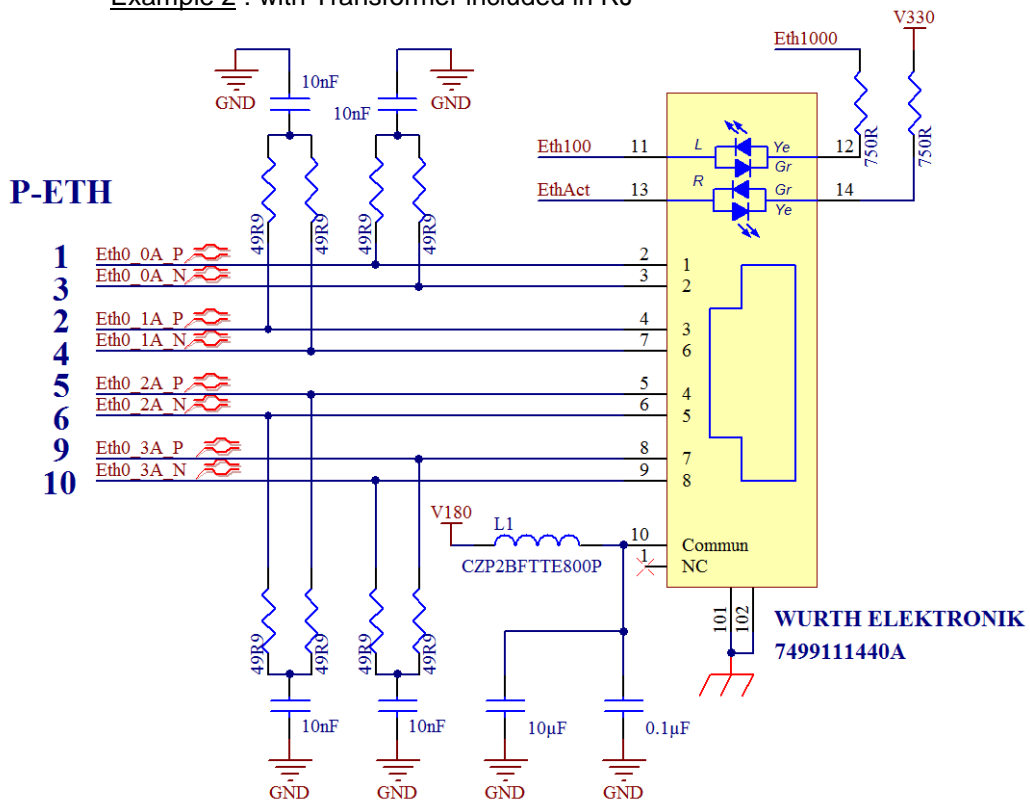
These signals can be used to relocate a RJ45 Plug far away in your system. The signals should be correctly insulated, routed with wires of equal lengths and with a 100ohms differential impedance, especially with long distance. You can see at the next page some examples of insulation for these signals

You can also connected two PHY together by using two transformers (using two times "Example 1", for each PHY)

P-GEN Example 1 : with Transformer and RJ separated



Example 2 : with Transformer included in RJ



V.6 P-USER

Receptacle connector 0.5mm pitch *DF12-20DS-0.5V* from *HIROSE*

- Compatible with Header HIROSE Series DF12

(ex : DF12(5.0)-20DP-0.5V(86)
 DF12B(5.0)-20DP-0.5V(86)
 DF12D(5.0)-20DP-0.5V(81)
 DF12E(5.0)-20DP-0.5V(81))

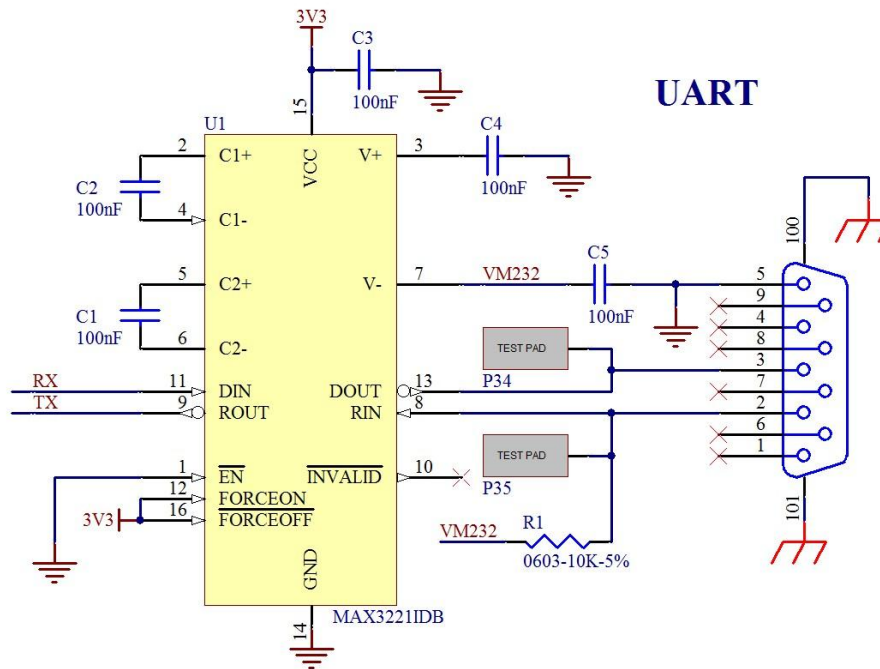
- Using this connector requires a height of 5mm between WLn-LINK-OEM and your motherboard (see chapter "*MOUNTING OF THE DEVICE*" for more information)

- This connector is not needed for common use of the WLn-LINK-OEM. It only provides some additional functions.

I²C and UART1 should be only used with ACKSYS authorization. Their incorrect use could irremediably corrupt the product and void all pertaining guaranty.

| Pin | Fonction | Description |
|-----|----------------------|--|
| 1 | SCL | For I ² C (<i>Address 0x48, 0x60, 0x61, 0x74 already used and polled regularly. Linux I²C driver, support for /dev/i2c-0, I2C leds and gpios, PCA and PCF algorithms</i>) |
| 2 | SDA | |
| 3 | RX | For UART1, Reserved for factory testing, do not use |
| 4 | TX | |
| 5 | 3V3 | <i>Only voltage reference, not for power use</i> |
| 6 | GND | <i>Only voltage reference, not for power use</i> |
| 7 | RX | User UART2, May be left unconnected if not used (<i>RTS, only for driving RS485 transceivers</i>) |
| 8 | TX | |
| 9 | RTS | |
| 10 | <i>Not connected</i> | - |
| 11 | LED1 CKEY | For CKEY use, only on option Must handle 20MHz signals of with routing constraints (wires of equal length, far away from spurious signals) (May be left unconnected if not used) LED1 (green) active at 3.3V to indicate that CKEY is OK LED2 (red) active at 3.3V to indicate an error on CKEY LED1 or 2 flashing during access to CKEY LED1 and 2 OFF if CKEY not detected |
| 12 | LED2 CKEY | |
| 13 | CKEY 8 | |
| 14 | CKEY 7 | |
| 15 | CKEY 6 | |
| 16 | CKEY 5 | |
| 17 | CKEY 4 | |
| 18 | CKEY 3 | |
| 19 | CKEY 2 | |
| 20 | CKEY 1 | |

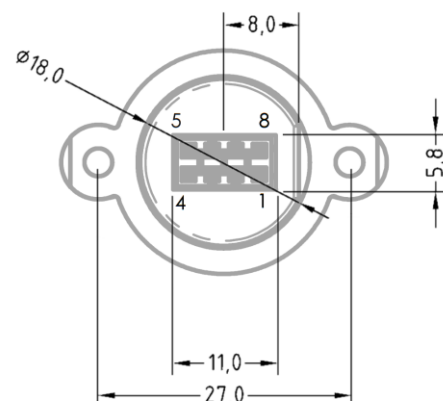
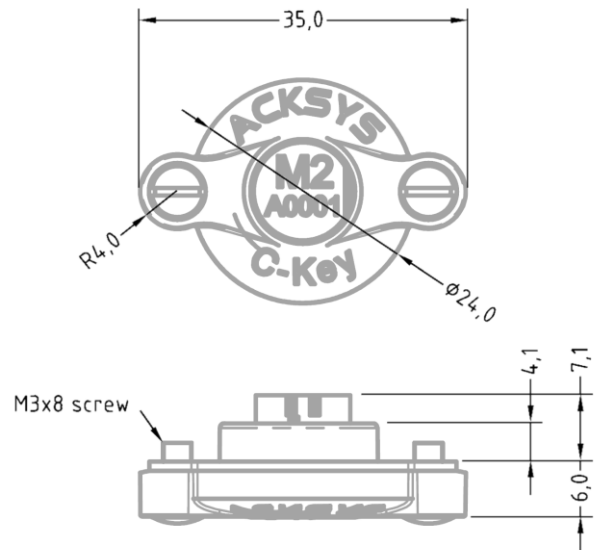
Example of wiring for UART (1 and/or 2) :



The CKEY is an optional storage device used to save and restore the product configuration. You can relocate it somewhere else in your system. It should be removed and inserted only when power supply source is OFF.

CKEY functionality is currently not implemented and shouldn't be used. It will be available soon !

The relevant CKEY model for WLn-LINK-OEM range is CKEY-M2.



Pinout and mechanical dimensions of CKEY, in mm \pm 0.1 :

V.7 ANTENNA CONNECTOR

With normal version : 3 x U.FL male connectors, from Hirose

With /3 version : 3 x MMCX male connectors

- Connect it three 2.4/5GHz antennas with 50ohms coaxial cable (with U.FL or MMCX female connector according to radio card)

- You should use 3 antennas at the same time, else performance will be drop.

WARNING: Leaving an antenna connector unplugged may damage the miniPCI radio module of /3 version.

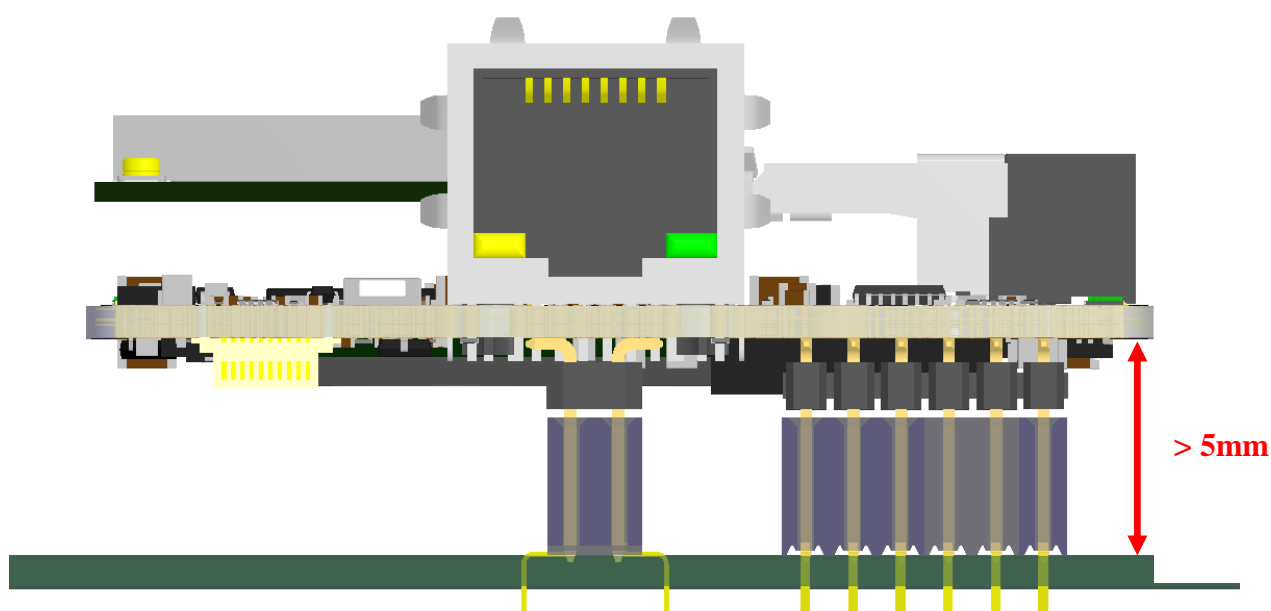
V.8 P-ADM

This connector, present on the board, is not documented voluntarily and shouldn't be used.

VI MOUNTING OF THE DEVICE

VI.1 Not using P-USER

Usually, when not using signals from P-USER, you can plug the WLn-LINK-OEM at the height you want (minimum of 5mm), with the previously indicated connectors .

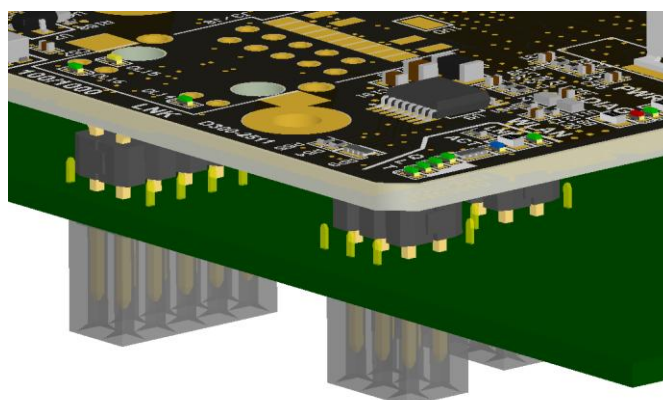
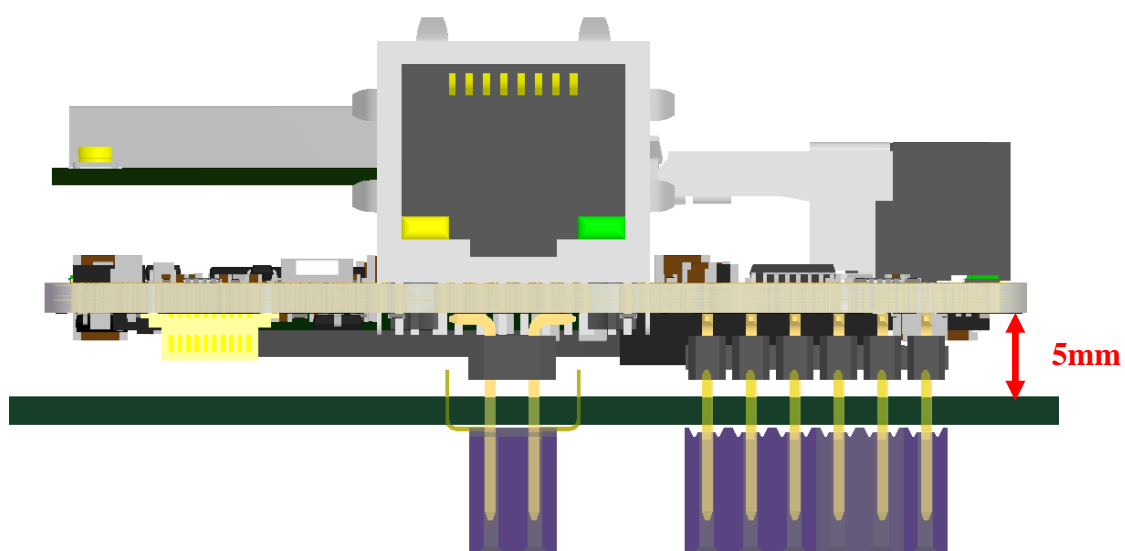


VI.2 Using P-USER

If you need P-USER, you should mandatorily mount WLn-LINK-OEM at the height of 5mm.

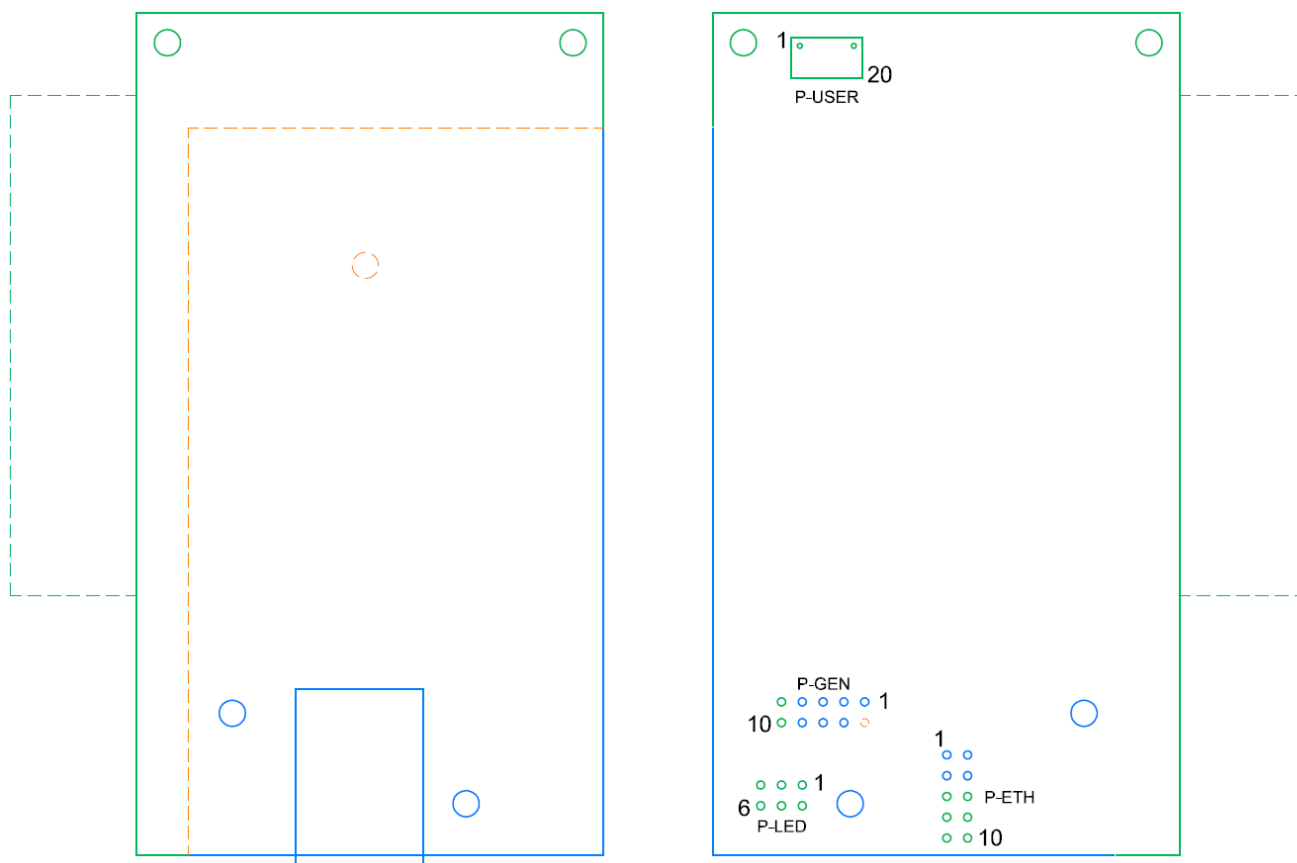
To do this, you must use special connectors for P-GEN, P-LED and P-ETH, that will be bottom mounted, with bottom entry.

(ex : SAMTEC BSW-1xx-xx-L-D
SAMTEC BCS-1xx-L-D-PE-BE
ANTELEC Series FT2)



VI.3 WLg-LINK-OEM compatibility

The WLn-LINK-OEM has kept some compatibility with the WLg-LINK-OEM as you can see below :



- Identical between WLn-LINK-OEM and WLg-LINK-OEM
- New with WLn-LINK-OEM
- Give up from WLg-LINK-OEM

VII DEFAULT CONFIGURATION

- **Ethernet :**

- Auto-negotiation
- Auto-crossing

- **Wi-Fi :**

- Mode: Access Point
- Wi-Fi: 802.11n, HT20, g band (2.4GHz)
- Channel: 6
- SSID: acksys (*broadcast*)
- Security: *disabled*

- **Web Server IP address:**

<http://192.168.1.253>

More information about configuration is provided in the document "WLn products user guide DTUS065".

VIII TECHNICAL CHARACTERISTICS

| Mechanical characteristics | |
|-------------------------------|--|
| Dimensions (w/o antennas) | WLn-LINK-OEM-RJ L x l x h = 103 x 53.3 x 27.7 mm L x l x h = 4.06 x 2.10 x 1.09 in |
| | WLn-LINK-OEM-TTL L x l x h = 103 x 53.3 x 23.9 mm L x l x h = 4.06 x 2.10 x 0.94 in |
| | WLn-LINK-OEM-RJ/3 L x l x h = 103 x 68.7 x 27.7 mm L x l x h = 4.06 x 2.70 x 1.09 in |
| | WLn-LINK-OEM-TTL/3 L x l x h = 103 x 68.7 x 25.9 mm L x l x h = 4.06 x 2.70 x 1.02 in |
| Weight | Standard versions : max 60 g (2.1 oz) /3 versions : max 75 g (2.7 oz) |
| Enclosure | None |
| Operating temperatures ranges | Standard version : -20 to +70°C /3 version : -40 to +75°C |
| Status indicators | 12 LEDs: see LEDs definition section |
| Push button | Short push, anytime: → Reset Long push (> 2 sec.): - while operating: → Restore factory settings - while in emergency upgrade mode: → Restore factory settings - at startup: → Enter emergency upgrade |

| Power supply Input | |
|--------------------|---|
| Standard versions | 5V ± 0.25V power supplies, without polarity protection. 5.5W moy. (8.5W peak) |
| /3 versions | 5V ± 0.25V power supplies, without polarity protection. 8.5W moy. (11.5W peak) |

| Software | |
|-------------------------|---|
| Device configuration | Automatic device discovery Built in web based utility for easy configuration from any web browser (username/password protection & https) |
| Firmware upgrade | Yes (via web browser) |
| SNMP | SNMP V1, V2C (V3 not yet available) |
| Operating mode | AP (Access Point)/ Repeater, Bridge/Client, Mesh, WDS |
| AP mode only | |
| Network topology | Infrastructure or mesh modes |
| Security | WEP, WPA-PSK/WPA2-PSK, WPA/ WPA2 with 802.1x authenticator, SSID visibility status. |
| Client/Bridge mode only | |
| Network topology | infrastructure mode, ad-hoc mode |
| Security | WEP, WPA-PSK, WPA2-PSK. 802.1x supplicant. AES/TKIP/WEP by hardware encryption |
| Mesh mode only | |
| Network topology | mesh mode |
| Security | WEP, WPA-PSK, WPA2-PSK. 802.1x supplicant. AES/TKIP/WEP by hardware encryption |

| Ethernet interface | |
|--------------------|--|
| Number of ports | 1 |
| Type of ports | 10 BASE T, 100 BASE Tx or 1000 BASE T automatic negotiation (HDX/FDX, 10/100 Mbps), auto MDI/MDI-X |
| Connector | RJ45 for WLn-LINK-OEM-RJ "Free use" for WLn-LINK-OEM-TTL |

| Wi-Fi interface | |
|--------------------------------|---|
| Radio modes | Support for IEEE 802.11a/h, 802.11b, 802.11g and 802.11n. |
| Chipset | ATHEROS AR9xxx |
| Data rates | 802.11n : up to 300 Mbps 802.11a/h : 6 to 54 Mbps 802.11b : 1 to 11 Mbps 802.11g : 1 to 54 Mbps |
| Frequency band for 802.11a/n | 5 GHz; 4.900 to 5.850 GHz |
| Frequency band for 802.11b/g/n | 2.4 GHz; 2.300 to 2.500 GHz |
| Antennas & Connectors | Standard versions : 3 x U.FL male connector /3 versions : 3 x MMCX male connector <i>Delivered without antennas</i> |

| Information given for 100mW standard radio card | | | |
|---|--|---|---|
| HT20 mode uses 20 MHz width channels HT40 mode uses 40 MHz width channels MCS is "Modulation and Coding Schemes" rates (0 to 7 for 1 stream, 8 to 15 for 2 streams) | | | |
| Tx output power (Radio card output) | 802.11b | 19 dBm | |
| | 802.11g | 18 dBm @6-36M 17 dBm @48M 16 dBm @54M | |
| | 802.11a | 18 dBm @6-24M 17 dBm @36M 16 dBm @48M 15 dBm @54M | |
| | 802.11n HT20 g band | 19 dBm @MCS 0/8 to MCS 3/11 18 dBm @MCS 4/12 16 dBm @MCS 5/13 13 dBm @MCS 6/14 10 dBm @MCS 7/15 | |
| | 802.11n HT40 g band | 17 dBm @MCS 0/8 to MCS 4/12 16 dBm @MCS 5/13 13 dBm @MCS 6/14 10 dBm @MCS 7/15 | |
| | 802.11n HT20 a/h band | 18 dBm @MCS 0/8 to MCS 2/10 17 dBm @MCS 3/11 to MCS 4/12 16 dBm @MCS 5/13 12 dBm @MCS 6/14 10 dBm @MCS 7/15 | |
| | 802.11n HT40 a/h band | 17 dBm @MCS 0/8 to MCS 4/12 16 dBm @MCS 5/13 12 dBm @MCS 6/14 10 dBm @MCS 7/15 | |
| | Rx sensitivity (Radio card input) | Antenna configuration | 1 Rx |
| 802.11b | | -82 dBm @1M -76 dBm @11M | -96/-92 dBm @1M -91/-87 dBm @11M |
| 802.11g | | -82 dBm @6M -65 dBm @54M | -91/-92 dBm @6M -83/-78 dBm @54M |
| 802.11a | | -82 dBm @6M -65 dBm @54M | -95/-91 dBm @6M -82/-78 dBm @54M |
| 802.11n HT20 g band | | -82 dBm @MCS0 -64 dBm @MCS7 -82 dBm @MCS8 -64 dBm @MCS15 | -96/-92 dBm @MCS0 -79/-75 dBm @MCS7 -95/-91 dBm @MCS8 -77/-73 dBm @MCS15 |
| 802.11n HT40 g band | | -79 dBm @MCS0 -61 dBm @MCS7 -79 dBm @MCS8 -61 dBm @MCS15 | -90/-86 dBm @MCS0 -75/-70 dBm @MCS7 -90/-86 dBm @MCS8 -73/-69 dBm @MCS15 |
| 802.11n HT20 a/h band | | -82 dBm @MCS0 -64 dBm @MCS7 -82 dBm @MCS8 -64 dBm @MCS15 | -95/-91 dBm @MCS0 -77/-73 dBm @MCS7 -93/-89 dBm @MCS8 -75/-71 dBm @MCS15 |
| 802.11n HT40 a/h band | | -79 dBm @MCS0 -61 dBm @MCS7 -79 dBm @MCS8 -61 dBm @MCS15 | -91/-87 dBm @MCS0 -75/-71 dBm @MCS7 -90/-86 dBm @MCS8 -71/-67 dBm @MCS15 |
| Radio & EMC Certificate | FCC Part 15.401 ~ Part 15.407, FCC Part 15.247, FCC Class-B, FCC part 15.107 & Part 15.109; limited module level approval. | | |
| | IC RSS210, RSS139-1, ICES-003, limited module level approval. | | |
| | ETSI, EN 301893, EN 60950, EN 300328, EN 301489-1/17, EN 55022, EN 55024 | | |

| Information given for high-power 400mW radio card | | | |
|--|-----------------------|--|--|
| Tx output power (Radio card output) | 802.11b | 27.8 dBm | |
| | 802.11g | 27.8 dBm @6-24M 26.8 dBm @36M 25.8 @48M 24.8 @54M | |
| | 802.11a | 24.8 dBm @6-24M 23.8 dBm @36M 22.8 dBm @48M 22.8 dBm @54M | |
| | 802.11n HT20 g band | 27.8 dBm @MCS 0/8 to MCS 3/11 26.8 dBm @MCS 4/12 25.8 dBm @MCS 5/13 24.8 dBm @MCS 6/14 to MCS 7/15 | |
| | 802.11n HT40 g band | 24.8 dBm @MCS 0/8 to MCS 5/13 23.8 dBm @MCS 6/14 to MCS 7/15 | |
| | 802.11n HT20 a/h band | 25.8 dBm @MCS 0/8 to MCS 1/9 24.8 dBm @MCS 2/10 23.8 dBm @MCS 3/11 22.8 dBm @MCS 4/12 21.8 dBm @MCS 5/13 20.8 dBm @MCS 6/14 19.8 dBm @MCS 7/15 | |
| | 802.11n HT40 a/h band | 25.8 dBm @MCS 0/8 to MCS 2/10 22.8 dBm @MCS 3/11 21.8 dBm @MCS 4/12 20.8 dBm @MCS 5/13 19.8 dBm @MCS 6/14 18.8 dBm @MCS 7/15 | |
| Rx sensitivity (Radio card input) | Antenna configuration | 1 Rx | 3 Rx |
| | 802.11b | -82 dBm @1M -76 dBm @11M | -96/-92 dBm @1M -90/-86 dBm @11M |
| | 802.11g | -82 dBm @6M -65 dBm @54M | -95/-91 dBm @6M -82/-78 dBm @54M |
| | 802.11a | -82 dBm @6M -65 dBm @54M | -93/-89 dBm @6M -80/-76 dBm @54M |
| | 802.11n HT20 g band | -82 dBm @MCS0 -64 dBm @MCS7 | -93/-89 dBm @MCS0 -76/-72 dBm @MCS7 |
| | 802.11n HT40 g band | -79 dBm @MCS0 -61 dBm @MCS7 | -90/-87 dBm @MCS0 -73/-69 dBm @MCS7 |
| | 802.11n HT20 a/h band | -82 dBm @MCS0 -64 dBm @MCS7 | -95/-91 dBm @MCS0 -77/-73 dBm @MCS7 |
| | 802.11n HT40 a/h band | -79 dBm @MCS0 -61 dBm @MCS7 | -91/-85 dBm @MCS0 -74/-70 dBm @MCS7 |