

# EmbedAir100 HARDWARE MANUAL



<b>EmbedAir100 HARDWARE MANUAL</b>
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# I INTRODUCTION

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This hardware documentation applies to the following products:

- EmbedAir100/R (RJ version)
- EmbedAir100/T (TTL version)
- EmbedAir100/K (RJ + Jack version)

Together with the "WaveOS User Guide (ref DTUS070)", 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 "WaveOS User Guide (DTUS070)" describes the configuration and use of the equipment.

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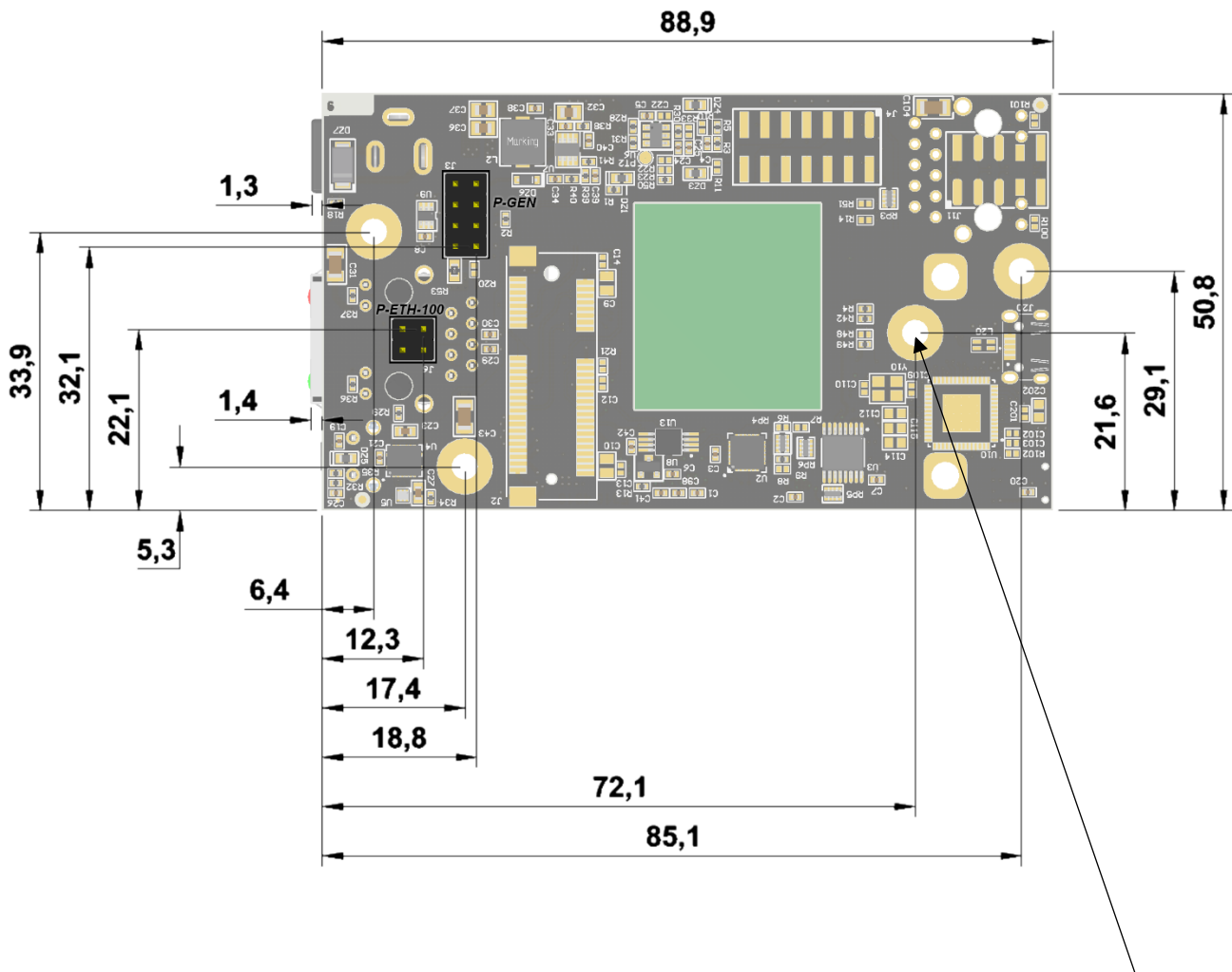
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## II MECHANICAL DIMENSIONS

### II.1 Bottom view

All dimensions in mm  $\pm 0.2$

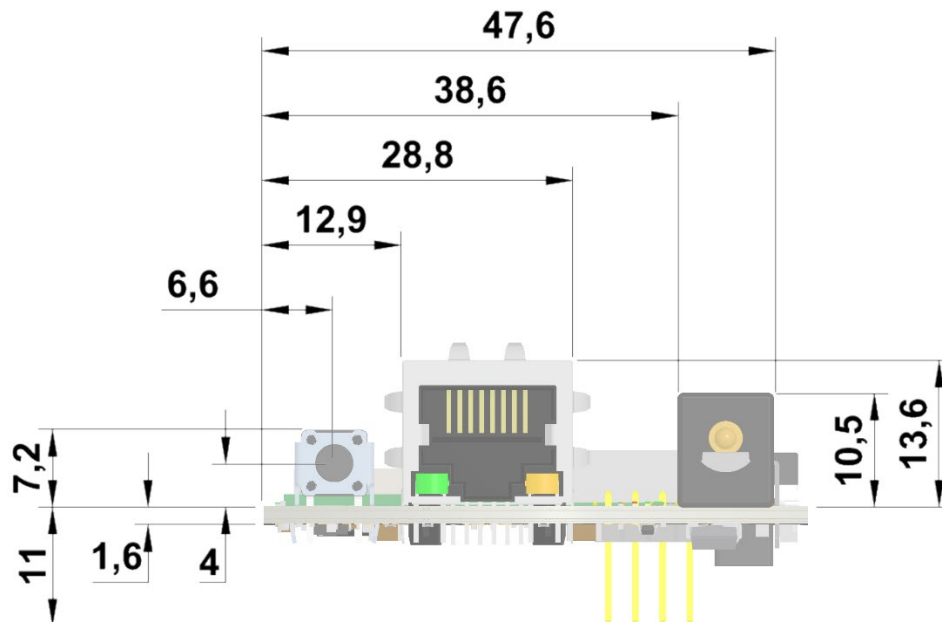


Mounting hole not recommended for new design :  
10.8mm M3 standoff mounted by default, only for  
backwards compatibility with WLg-LINK-OEM,  
(Must be removed for new design)

**Mounting holes (4 x Ø3.2mm) isolated from GND and connected to RJ45 shielding**

## II.2 Front view

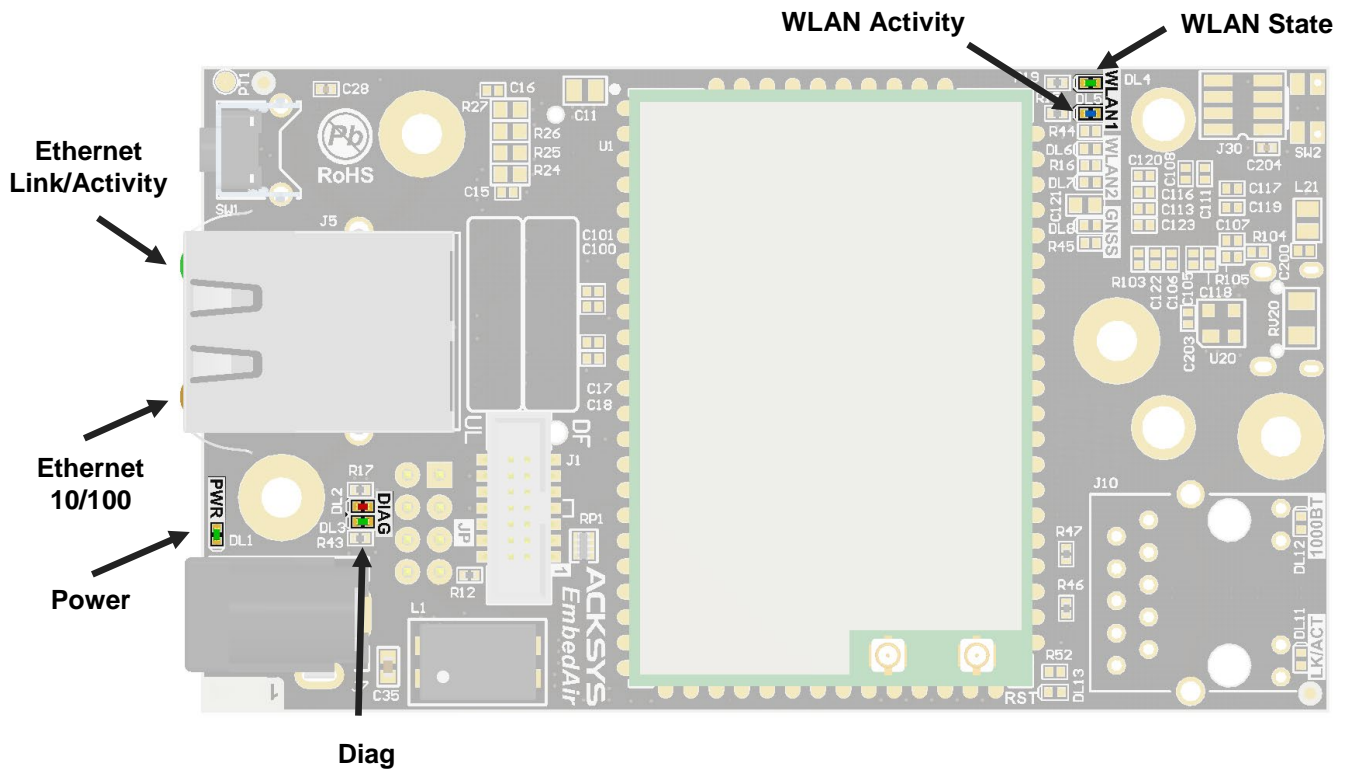
All dimensions in mm  $\pm 0.2$



## III LEDS AND BUTTON

### III.1 Leds

The leds are directly available on the EmbedAir:



### III.2 Signals relocation

All the leds and button are also made available to the host motherboard via the P-GEN (J3) connector (except WLAN State, 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/Software 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 Ethernet 10/100

**OFF** when Ethernet connection is negotiated in **10** MBit/s  
**YELLOW** when Ethernet connection is negotiated in **100** MBit/s

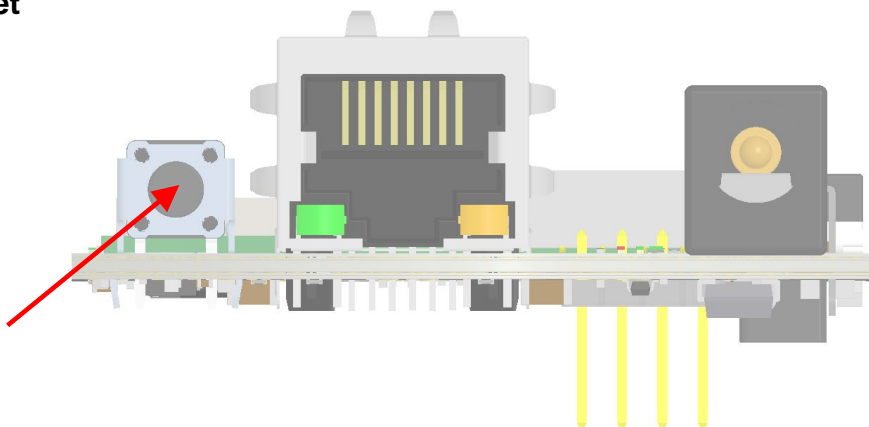
Available at the same location either directly on the board (for TTL version) or on the RJ connector (for RJ version)

### III.2.6 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 "WaveOS User Guide - DTUS070" for more information)

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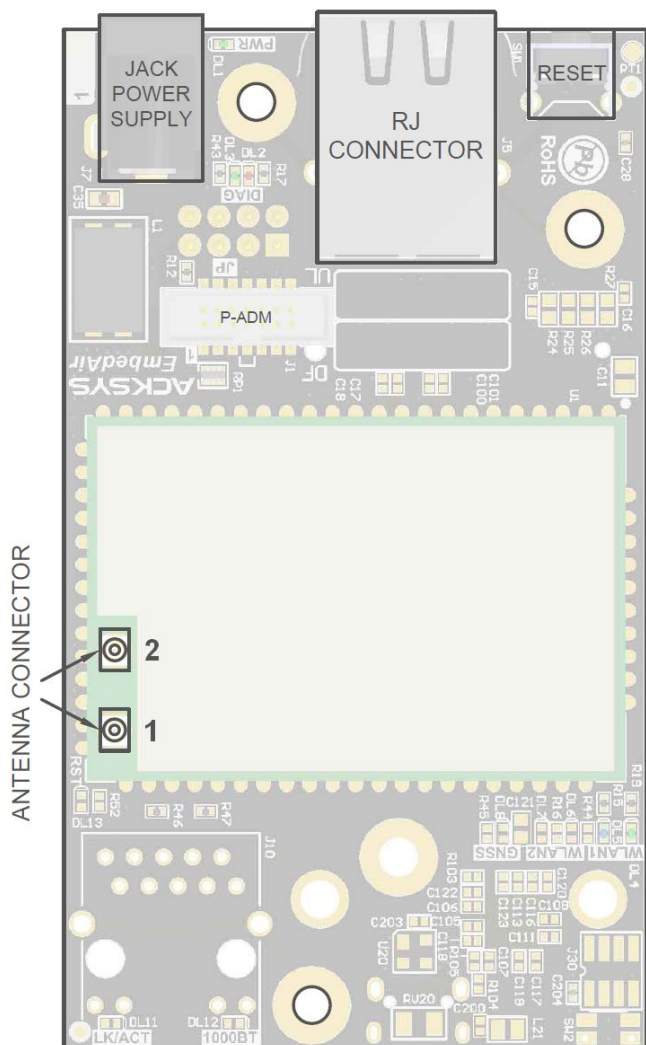
## **IV EVALUATION BOARD**

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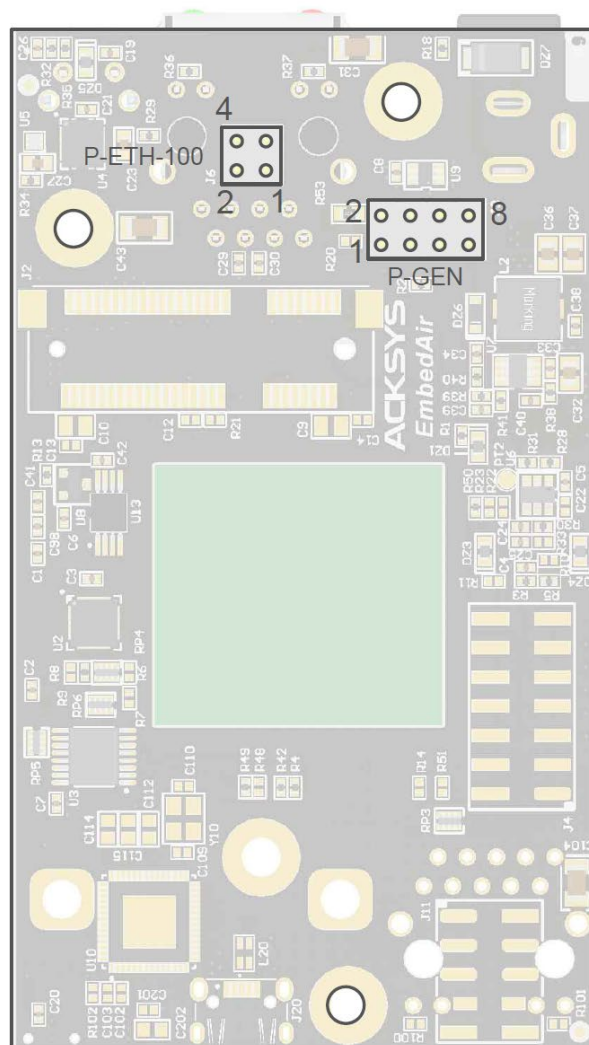
TBD

# V WIRING CONNECTORS

## V.1 Pinout



Top view



Bottom view

## V.2 P-GEN (J3)

HE10/HE13/HE14/Strip Male Header 2.54mm pitch, 2x4 pins

- Compatible with HE10/HE13/HE14 Female Receptacle  
(ex: SAMTEC Series BCS, ESQ, ESW...  
ANTELEC Series APC104, AF2D... )

Pin	In / Out	Function	Voltage	Max current
1	Out	LED Ethernet 100 BaseT	active at 0V	2 mA
2	Out	2V6 on <u>TTL version</u> , only for feeding the Ethernet transformer	<i>not for power use</i>	-
	In/Out	3V3 on <u>RJ version</u> (for Power supply, only for backwards compatibility with WLg-LINK-OEM, <b>not recommended for new design</b> )	+3.3V -0 +0.2	1.5A In 100mA Out
3	Out	LED Ethernet Link/Activity	active at 0V	2 mA
4	Open drain Out	LED WLAN Activity	active at 0V	15 mA
5	Open drain Out	LED Diag	"Green" at 0V	15 mA
6	In	Reset	active at 3.3V	20 µA
7	In	Power +5V	<b>+5V ± 0.25</b>	1 A
8	-	Power GND	<b>0V</b>	

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

## V.3 RJ CONNECTOR (J10)

LAN-Transformer RJ45 10/100 Base Tx

**Only available on RJ version**

It allows connecting a classical Ethernet cable (*cat 5e or more*)

## V.4 P-ETH-100 (J6)

HE10/HE13/HE14/Strip Male Header 2.54mm pitch, 2x2 pins

### Only available on TTL version

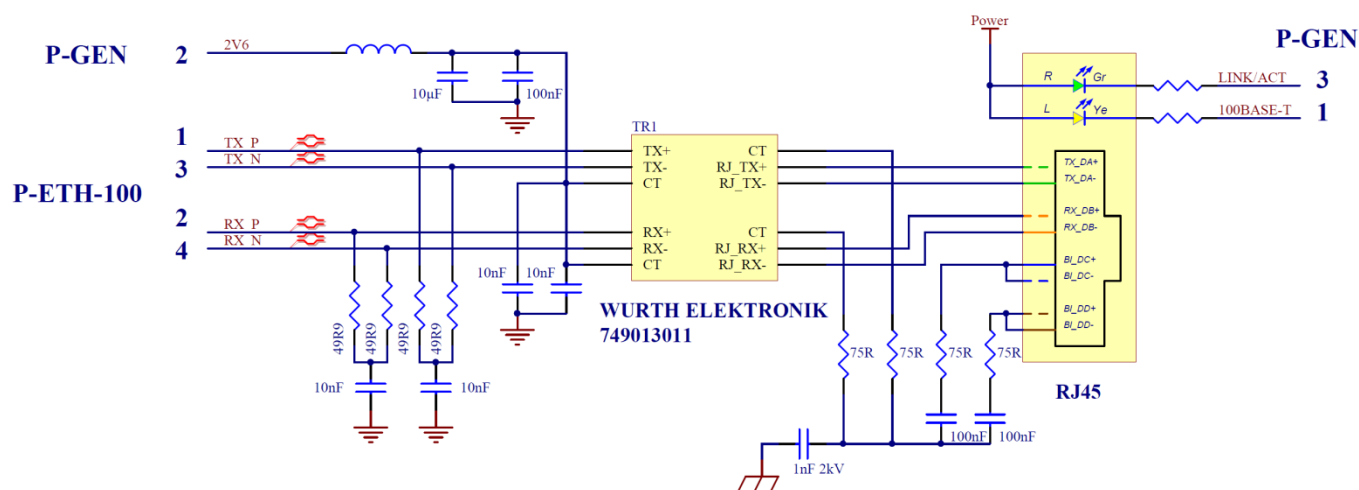
- Compatible with HE10/HE13/HE14 Female Receptacle  
(ex: SAMTEC Series BCS, ESQ, ESW...  
ANTELEC Series APC104, AF2D... )

This connector directly gives raw signals from the Ethernet PHY component, without insulation. The PHY used on the EmbedAir100 is *AR8032* from *Qualcomm Atheros*.

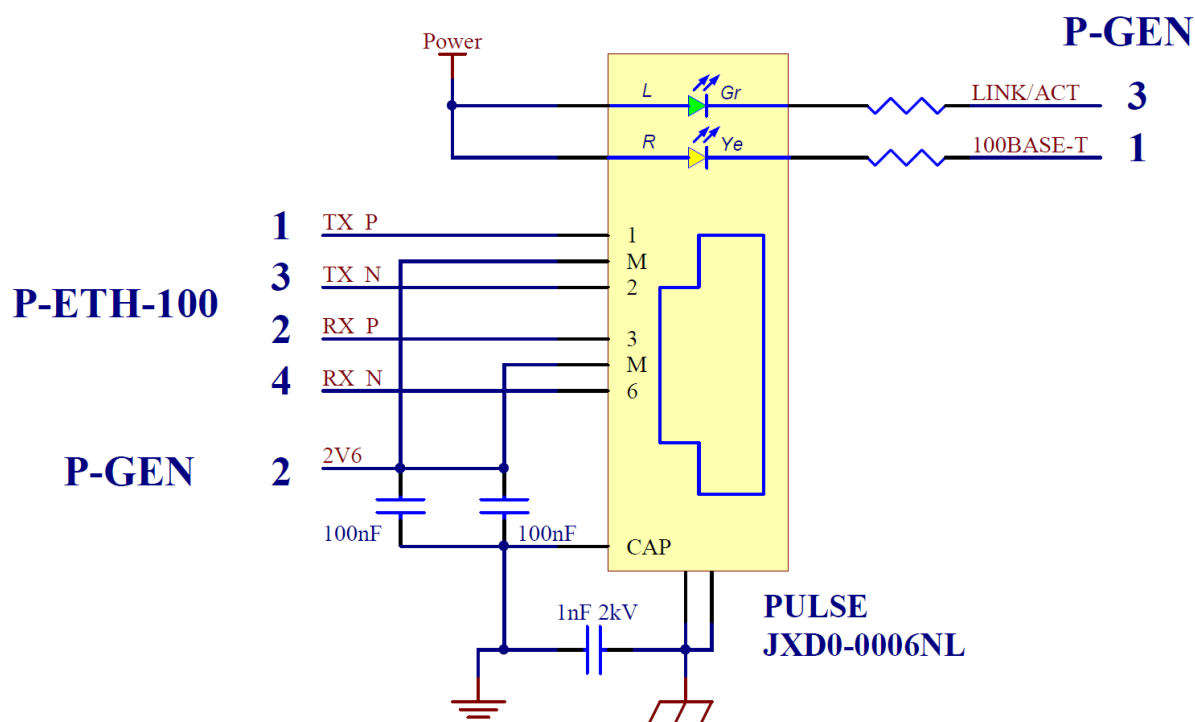
These signals can be used to relocate a RJ45 Plug far away in your system. The signals should be correctly insulated, routed with wires of equal lengths and with a 100ohms differential impedance, especially with long distance. You can see at the next page some examples of insulation for these signals

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

Example 1 : with Transformer and RJ separated



Example 2 : with Transformer included in RJ



## V.5 ANTENNA CONNECTOR

2 x U.FL male connectors, from Hirose, for WiFi

- Connect it two 2.4/5GHz antennas with 50ohms coaxial cable through U.FL female connector.

- 2 antennas must be used in 11n mode to achieve optimal performance (2 streams).

## V.6 P-ADM (J1)

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

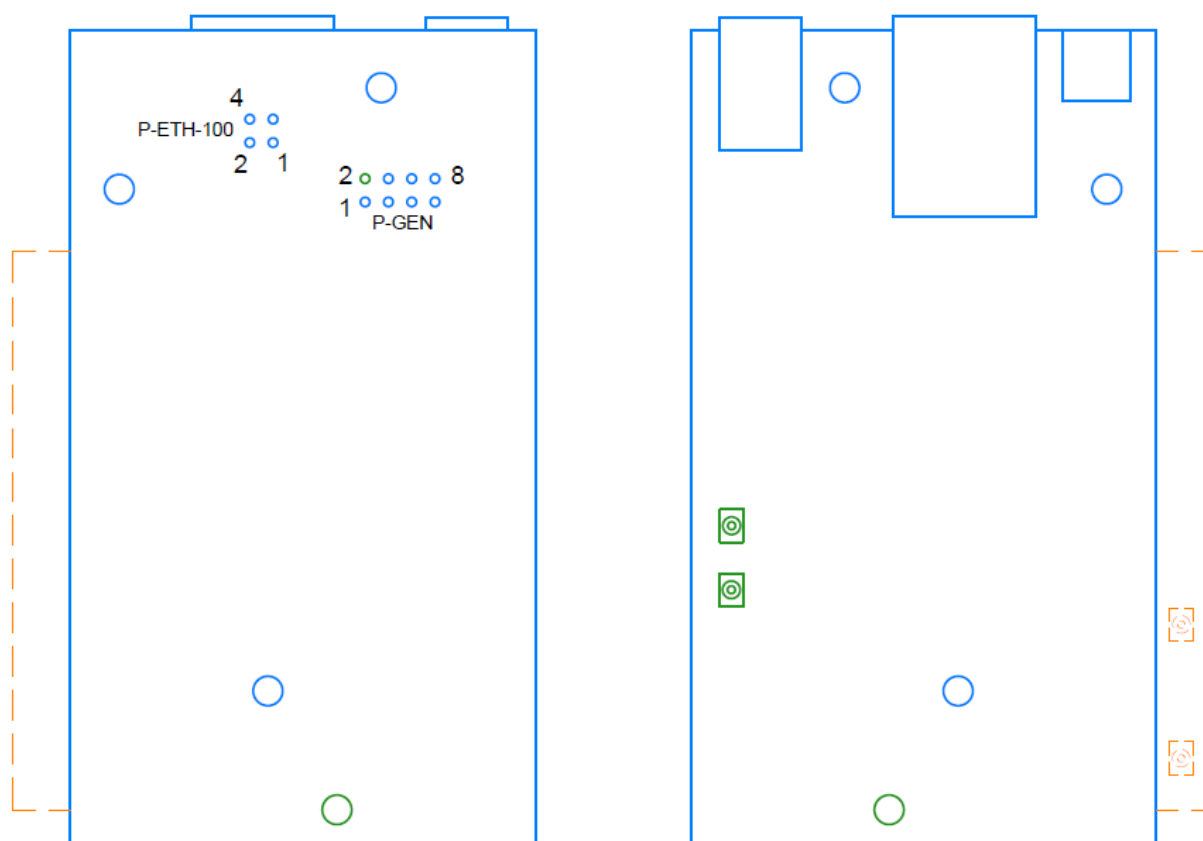
## VI MOUNTING OF THE DEVICE

### VI.1 Standard mounting

Plug the EmbedAir100 at a height of 5mm minimum from your motherboard, with the previously indicated connectors.

### VI.2 WLg-LINK-OEM compatibility

The EmbedAir100 has kept some compatibility with the WLg-LINK-OEM with minor differences as illustrated below:



All physical LEDs on board are at different locations between WLg-LINK-OEM and EmbedAir100.

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## VII DEFAULT CONFIGURATION

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- **Ethernet :**

- Auto-negotiation
- Auto-crossing

- **Wi-Fi :**

- **Disabled**
- Mode: Access Point
- Wi-Fi: 802.11n, HT20, 5GHz band
- Channel: 36
- SSID: acksys (*broadcast*)
- Security: *disabled*

- **Web Server IP address:**

<http://192.168.1.253>

More information about configuration is provided in the document "WaveOS User Guide - DTUS070".



## VIII TECHNICAL CHARACTERISTICS

Mechanical characteristics	
Dimensions (w/o antennas)	EmbedAir100/R & /K (RJ versions) L x l x h = 88.9 x 50.8 x 25 mm L x l x h = 3.50 x 2.00 x 0.98 in  EmbedAir100/T (TTL version) L x l x h = 88.9 x 50.8 x 19 mm L x l x h = 3.50 x 2.00 x 0.75 in
Weight	RJ version : max 35 g (1.23 oz) TTL version : max 27 g (0.95 oz)
Enclosure	None
Operating temperatures ranges	-20 to +60°C
Status indicators	6 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	
	5V ± 0.25V power supplies, without polarity protection. 3.5W average. (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
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 or 100 BASE Tx automatic negotiation (HDX/FDX,10/100 Mbps), auto MDI/MDI-X
Connector	RJ45 for EmbedAir100/R & /K "Free use" for EmbedAir100/T

Wi-Fi interface		
Radio modes	Support for IEEE 802.11a/h, 802.11b, 802.11g and 802.11n.	
Chipset	Qualcomm QCA95xx	
Data rates	802.11n : up to 300 Mbps (2T/2R) 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; 5.170 to 5.835 GHz	
Frequency band for 802.11b/g/n	2.4 GHz; 2.402 to 2.494 GHz	
Antennas & Connectors	2 x U.FL male connector <i>Delivered without antennas</i>	
<b>Radio specifications :</b>		
Tx output power (Radio card output per chain)	802.11n HT20 2.4GHz band	20.5 dBm @ 7.2 Mbps (MCS 0) 18 dBm @ 72.2 Mbps (MCS 7)
	802.11n HT40 2.4GHz band	20.5 dBm @ 15 Mbps (MCS 0) 18 dBm @ 150 Mbps (MCS 7)
	802.11n HT20 5GHz band	18 dBm @ 7.2 Mbps (MCS 0) 15 dBm @ 72.2 Mbps (MCS 7)
	802.11n HT40 5GHz band	18 dBm @ 15 Mbps (MCS 0) 15 dBm @ 150 Mbps (MCS 7)
	Value for 1 chain, add 3 dBm for 2 chains	
Rx sensitivity (Radio card input)	802.11n HT20 2.4GHz band	-92 dBm @ 7.2Mbps (MCS 0) -76 dBm @ 72.2Mbps (MCS 7)
	802.11n HT40 2.4GHz band	-90 dBm @ 15 Mbps (MCS 0) -73 dBm @ 150 Mbps (MCS 7)
	802.11n HT20 5GHz band	-96 dBm @ 7.2Mbps (MCS 0) -75 dBm @ 72.2Mbps (MCS 7)
	802.11n HT40 5GHz band	-91 dBm @ 15 Mbps (MCS 0) -72 dBm @ 150 Mbps (MCS 7)

Radio & EMC information	<p><b>CE</b> :</p> <p>a3(1)(a) : EN 62311, EN 60950-1  a3(1)(b) : ETSI EN 301 489-1, ETSI EN 301 489-17  a3(2) : ETSI EN 300 328, ETSI EN 301 893</p> <p><b>FCC</b> : FCC CFR Title 47 Part 15 Subpart C Section 15.247</p> <p><b>FCC Warning :</b>  This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:  (1) This device may not cause harmful interference, and  (2) this device must accept any interference received, including interference that may cause undesired operation.  Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment</p> <p>If the FCC identification number is not visible when the module is installed inside another device, then the outside of the device into which the module is installed must also display a label referring to the enclosed module. This exterior label can use wording such as the following: "<b>Contains Transmitter Module FCC ID: Z9W-RMB</b>", when the module is installed inside another device, the user manual of this device must contain below warning statements;  1. This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:  (1) This device may not cause harmful interference.  (2) This device must accept any interference received, including interference that may cause undesired operation.  2. Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.</p> <p><b>NOTE:</b>  This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules.  These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:  -Reorient or relocate the receiving antenna.  -Increase the separation between the equipment and receiver.  -Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.  -Consult the dealer or an experienced radio/TV technician for help.  This modular complies with FCC RF radiation exposure limits for an uncontrolled environment. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter. This modular must be installed and operated with a minimum distance of 20 cm between the radiator and user body.  The device indoor use only for 5150MHz-5250MHz.</p> <p><b>IC :</b>  <b>IC Warning:</b>  This device complies with Industry Canada's license-exempt RSSs. Operation is subject to the following two conditions:  (1) This device may not cause interference; and  (2) This device must accept any interference, including interference that may cause undesired operation of the device.  Cet appareil est conforme aux CNR exemptes de licence d'Industrie Canada . Son fonctionnement est soumis aux deux conditions suivantes :  ( 1 ) Ce dispositif ne peut causer d'interférences ; et  ( 2 ) Ce dispositif doit accepter toute interférence , y compris les interférences qui peuvent causer un mauvais fonctionnement de l'appareil.  This modular complies with IC RF radiation exposure limits set forth for an uncontrolled environment. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.  If the IC number is not visible when the module is installed inside another device, then the outside of the device into which the module is installed must also display a label referring to the enclosed module. This exterior label can use wording such as the following: "<b>Contains IC: 11468A-RMB</b>" , when the module is installed inside another device, the user manual of this device must contain below warning statements;  1. This device complies with Industry Canada's license-exempt RSSs. Operation is subject to the following two conditions:  (1) This device may not cause interference; and  (2) This device must accept any interference, including interference that may cause undesired operation of the device.  2. Cet appareil est conforme aux CNR exemptes de licence d'Industrie Canada . Son fonctionnement est soumis aux deux conditions suivantes :  ( 1 ) Ce dispositif ne peut causer d'interférences ; et  ( 2 ) Ce dispositif doit accepter toute interférence , y compris les interférences qui peuvent causer un mauvais fonctionnement de l'appareil.  The devices must be installed and used in strict accordance with the manufacturer's instructions as described in the user documentation that comes with the product  This modular complies with FCC RF radiation exposure limits for an uncontrolled environment. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter. This modular must be installed and operated with a minimum distance of 20 cm between the radiator and user body.  The device indoor use only for 5150MHz-5250MHz.</p>
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