



EVM-868-EUR
Data Guide

Wireless made simple[®]

⚠ Warning: Linx radio frequency ("RF") products may be used to control machinery or devices remotely, including machinery or devices that can cause death, bodily injuries, and/or property damage if improperly or inadvertently triggered, particularly in industrial settings or other applications implicating life-safety concerns. No Linx Technologies product is intended for use in any application without redundancies where the safety of life or property is at risk.

The customers and users of devices and machinery controlled with RF products must understand and must use all appropriate safety procedures in connection with the devices, including without limitation, using appropriate safety procedures to prevent inadvertent triggering by the user of the device and using appropriate security codes to prevent triggering of the remote controlled machine or device by users of other remote controllers.

Do not use this or any Linx product to trigger an action directly from the data line or RSSI lines without a protocol or encoder/decoder to validate the data. Without validation, any signal from another unrelated transmitter in the environment received by the module could inadvertently trigger the action.

All RF products are susceptible to RF interference that can prevent communication. RF products without frequency agility or hopping implemented are more subject to interference. This module does not have frequency agility built in, but the developer can implement frequency agility with a microcontroller.

Do not use any Linx product over the limits in this data guide. Excessive voltage or extended operation at the maximum voltage could cause product failure. Exceeding the reflow temperature profile could cause product failure which is not immediately evident.

Do not make any physical or electrical modifications to any Linx product. This will void the warranty and regulatory and UL certifications and may cause product failure which is not immediately evident.

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EVM-868-EUR RF Transceiver Module Data Guide



Description

The EVM-868-EUR features the EUR Series transceiver module combined with an SMA antenna connector and voltage regulator on a board with DIP headers. This simplifies integration of the module into prototype and low volume designs.



Figure 1: EVM-868-EUR Module


The module combines a state-of-the art low power wireless transceiver with a powerful multipoint-to-multipoint protocol controller to form a transparent wireless communication solution capable of replacing wires in almost any RS-232/422/485 application. With a 115dB link budget and very low power operation modes, the EUR Series is excellent for AMR, Home Automation, and any other application requiring long range (1 mile / 1.6km line of sight) and long battery life.

Features

- True UART to antenna solution
- DIP package for easy integration
- On-board voltage regulator
- 76.8kbps max RF data rate
- 2 channels in DTS mode
- 6 channels in LP mode
- Small size – 0.8" x 0.935" (20.32 x 23.75mm)
- Includes PHY and MAC protocol
- Low power Standby and Sleep modes
- CSMA medium access control
- 115dB link budget in DTS mode
- 4 modes allow user to optimize power and range
- 48-bit unique address
- 5 volt tolerant I/O
- 915MHz U.S. version available

Applications

- Direct RS-232/422/485 Wire replacement (requires external RS-232 to 3V CMOS conversion circuitry)
- Asset tracking
- Automated meter reading
- Industrial / home automation
- Wireless sensors
- Remote data logging
- Fleet management

 **Warning:** This product incorporates numerous static-sensitive components. Always wear an ESD wrist strap and observe proper ESD handling procedures when working with this device. Failure to observe this precaution may result in module damage or failure.

Ordering Information

| Ordering Information | | |
|----------------------|--|----------------------|
| Product Part No. | Description | Radiotronix Part No. |
| EVM-868-EUR-RA | TRM-868-EUR Evaluation Module, 868MHz, Right Angle SMA Connector | |
| EVM-868-EUR-ST | TRM-868-EUR Evaluation Module, 868MHz, Straight SMA Connector | Wi.232EUR-EVM-R |

Figure 2: Ordering Information

Electrical Specifications

| Electrical Specifications | | | | | | |
|--------------------------------|-------------|--------------------|------|--------------------|-------|-------|
| Parameter | Designation | Min. | Typ. | Max. | Units | Notes |
| Power Supply | | | | | | |
| Operating Voltage | V_{CC} | 4 | | 12 | VDC | |
| Supply Current | I_{CC} | | | | | |
| Receive | | | | 25 | mA | |
| Transmit, $P_o = 0\text{dBm}$ | | | | 35 | mA | |
| Transmit, $P_o = 13\text{dBm}$ | | | | 60 | mA | |
| Digital Interface | | | | | | |
| Output | | | | | | |
| Logic Low | V_{OL} | 0 | | 0.4 | VDC | |
| Logic High | V_{OH} | 2.5 | | V_{CC} | VDC | |
| Input | | | | | | |
| Logic Low | V_{IL} | 0 | | $0.3 \cdot V_{CC}$ | VDC | |
| Logic High | V_{IH} | $0.7 \cdot V_{CC}$ | | V_{CC} | VDC | |
| Environmental | | | | | | |
| Operating Temperature Range | | -40 | | 85 | °C | |

Figure 3: Electrical Specifications

Note: Please see the TRM-868-EUR data guide for complete information about the module, detailed specifications and configuration commands.

Pin Assignments

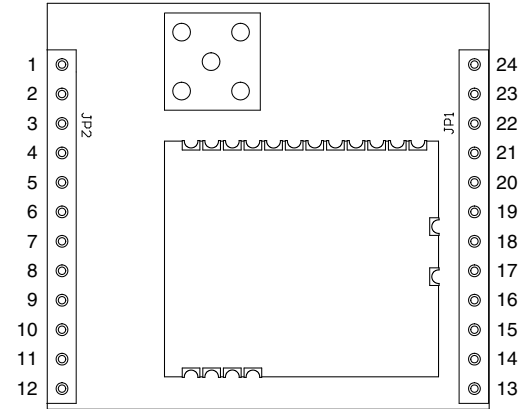


Figure 4: EUR Series EVM Module Pin Assignments (Top View)

Pin Descriptions

| Pin Descriptions | | | |
|--|-------------------------|-----|---|
| Pin Number | Name | I/O | Description |
| 1 | VCC | — | Supply Voltage |
| 2 | RXD | I | UART Receive Data Input. This is the input line for the configuration commands as well as data to be sent over the air. |
| 3 | TXD | O | UART Transmit Data Output. This is the output line for the configuration command responses as well as the data received over the air. |
| 4 | $\overline{\text{CTS}}$ | O | UART Clear To Send, active low. This line indicates to the host microcontroller when the module is ready to accept data. When $\overline{\text{CTS}}$ is high, the module is busy. When $\overline{\text{CTS}}$ is low, the module is ready for data. |
| 5 | $\overline{\text{CMD}}$ | I | Command Input. This line sets the serial data as either command data to configure the module or packet data to be sent over the air. Pull low for command data; pull high for packet data. |
| 6, 7, 8, 9, 10, 15, 16, 17, 18, 19, 20, 21, 22 | NC | — | No Electrical Connection. Do not connect any traces to these lines. |
| 11, 12, 13, 14, 23, 24 | GND | — | Ground |

Figure 5: EUR Series EVM Module Pin Descriptions

PCB Footprint

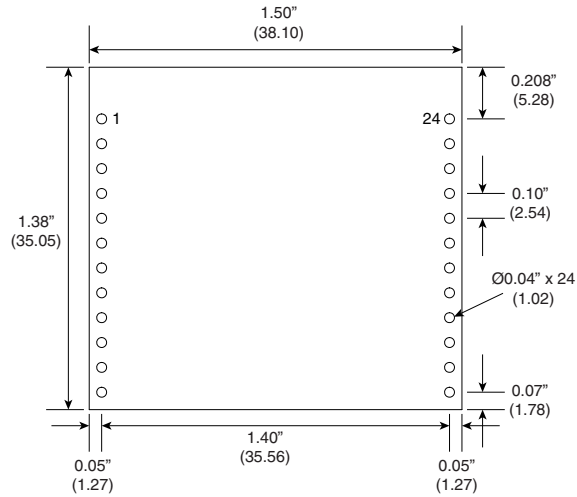


Figure 6: EUR Series EVM Module PCB Footprint

Board Layout Guidelines

The module's design makes integration straightforward; however, it is still critical to exercise care in PCB layout. Failure to observe good layout techniques can result in a significant degradation of the module's performance. Grounding, filtering, decoupling, routing and PCB stack-up are all important considerations for any RF design. Some basic design guidelines are provided here.

The module should, as much as reasonably possible, be isolated from other components on your PCB, especially high-frequency circuitry such as crystal oscillators, switching power supplies, and high-speed bus lines.

When possible, separate RF and digital circuits into different PCB regions.

Make sure internal wiring is routed away from the module and antenna and is secured to prevent displacement.

Bypass caps should be low ESR ceramic types and located directly adjacent to the pin they are serving.

In some instances, a designer may wish to encapsulate or "pot" the product. Since such compounds can considerably impact RF performance and the ability to rework or service the product, it is the responsibility of the designer to evaluate and qualify the impact and suitability of such materials.

Schematic Diagram

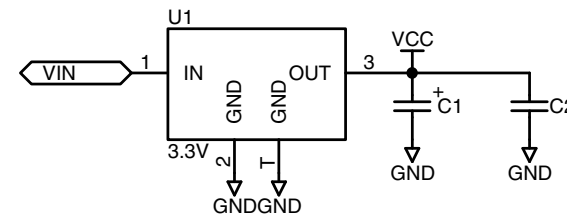
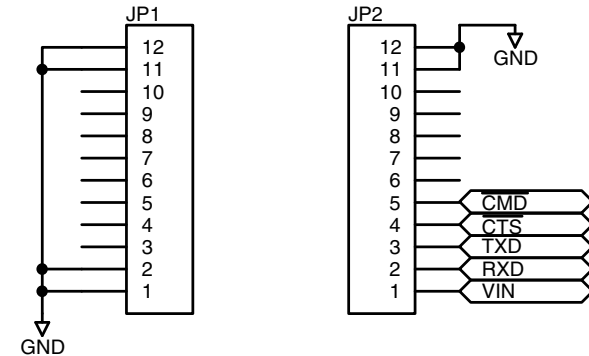
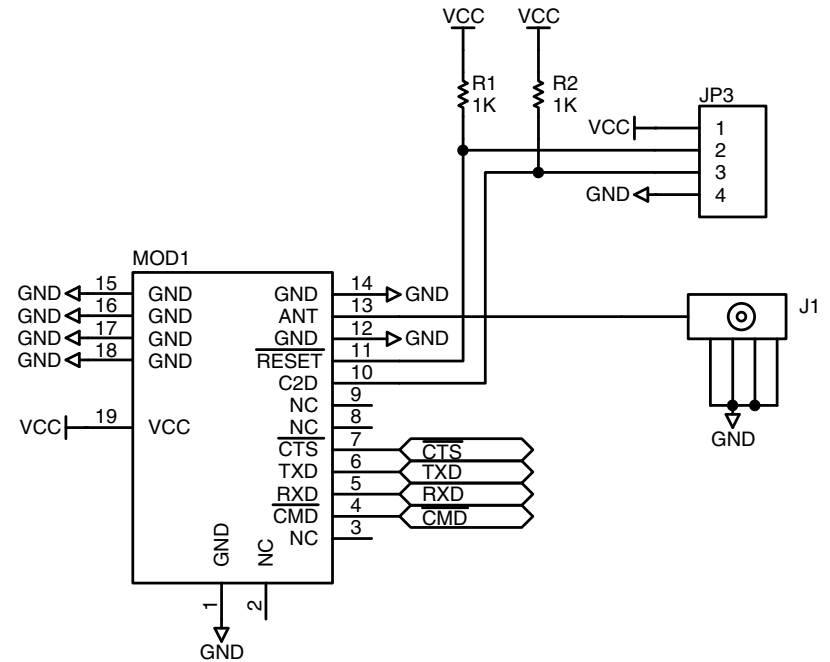


Figure 7: EUR Series EVM Module Schematic

Interference Considerations

The RF spectrum is crowded and the potential for conflict with unwanted sources of RF is very real. While all RF products are at risk from interference, its effects can be minimized by better understanding its characteristics.

Interference may come from internal or external sources. The first step is to eliminate interference from noise sources on the board. This means paying careful attention to layout, grounding, filtering and bypassing in order to eliminate all radiated and conducted interference paths. For many products, this is straightforward; however, products containing components such as switching power supplies, motors, crystals and other potential sources of noise must be approached with care. Comparing your own design with a Linx evaluation board can help to determine if and at what level design-specific interference is present.

External interference can manifest itself in a variety of ways. Low-level interference produces noise and hashing on the output and reduces the link's overall range.

High-level interference is caused by nearby products sharing the same frequency or from near-band high-power devices. It can even come from your own products if more than one transmitter is active in the same area. It is important to remember that only one transmitter at a time can occupy a frequency, regardless of the coding of the transmitted signal. This type of interference is less common than those mentioned previously, but in severe cases it can prevent all useful function of the affected device.

Although technically not interference, multipath is also a factor to be understood. Multipath is a term used to refer to the signal cancellation effects that occur when RF waves arrive at the receiver in different phase relationships. This effect is a particularly significant factor in interior environments where objects provide many different signal reflection paths. Multipath cancellation results in lowered signal levels at the receiver and shorter useful distances for the link.

Helpful Application Notes from Linx

It is not the intention of this manual to address in depth many of the issues that should be considered to ensure that the modules function correctly and deliver the maximum possible performance. As you proceed with your design, you may wish to obtain one or more of the following application notes which address in depth key areas of RF design and application of Linx products. These application notes are available online at www.linxtechnologies.com or by contacting Linx.

| Helpful Application Note Titles | |
|---------------------------------|---|
| Note Number | Note Title |
| AN-00100 | RF 101: Information for the RF Challenged |
| AN-00126 | Considerations for Operation Within the 902–928MHz Band |
| AN-00130 | Modulation Techniques for Low-Cost RF Data Links |
| AN-00140 | The FCC Road: Part 15 from Concept to Approval |
| AN-00160 | Considerations for Sending Data Over a Wireless Link |
| AN-00500 | Antennas: Design, Application, Performance |
| AN-00501 | Understanding Antenna Specifications and Operation |

Figure 8: Helpful Application Notes

Power Supply Requirements

The transceiver incorporates a precision low-dropout regulator which allows operation over a wide input voltage range. Despite this regulator, it is still important to provide a supply that is free of noise. Power supply noise can significantly affect the module's performance, so providing a clean power supply for the module should be a high priority during design.

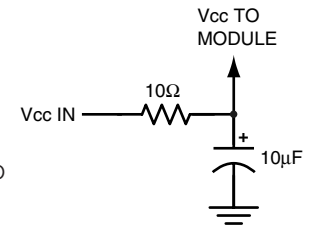


Figure 9: Supply Filter

A 10Ω resistor in series with the supply followed by a 10μF tantalum capacitor from V_{cc} to ground helps in cases where the quality of supply power is poor (Figure 9). This filter should be placed close to the module's supply lines. These values may need to be adjusted depending on the noise present on the supply line.



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