



# **HumPRC™ Series** **Evaluation Module** **Data Guide**

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 **Warning:** Some customers may want Linx radio frequency (“RF”) products 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 (“Life and Property Safety Situations”).

**NO OEM LINX REMOTE CONTROL OR FUNCTION MODULE SHOULD EVER BE USED IN LIFE AND PROPERTY SAFETY SITUATIONS.** No OEM Linx Remote Control or Function Module should be modified for Life and Property Safety Situations. Such modification cannot provide sufficient safety and will void the product’s regulatory certification and warranty.

Customers may use our (non-Function) Modules, Antenna and Connectors as part of other systems in Life Safety Situations, but only with necessary and industry appropriate redundancies and in compliance with applicable safety standards, including without limitation, ANSI and NFPA standards. It is solely the responsibility of any Linx customer who uses one or more of these products to incorporate appropriate redundancies and safety standards for the Life and Property Safety Situation application.

**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 have a frequency hopping protocol built in, but the developer should still be aware of the risk of interference.

**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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# HumPRC™ Series Evaluation Module

## Data Guide



Figure 1: HumPRC™ Series Evaluation Modules; from left: EVM-\*\*\*-PRC, EVM-\*\*\*-PRC-CAS, EVM-\*\*\*-PRC-UFL

### Description

The HumPRC™ Series is the most complete system to integrate bi-directional remote control into many different applications. No programming is required and both module and finished hardware options are available, making it the easiest solution to implement.

The module provides long-range transmission at 868MHz and 900MHz for multi-region operation, utilizing frequency hopping and industry-standard encryption for secure and robust communications. The HumPRC™ Series interoperates with Linx's HumPRO™ family, making it the only remote control solution that simultaneously supports data applications for seamless integration with sensor and control IoT applications.

The evaluation module contains the surface mount HumPRC™ Series transceiver module on a board with through-hole headers. This small board simplifies prototyping with the HumPRC™ Series module, allowing it to be integrated into a host PCB without requiring any soldering.

There are three versions of the evaluation module, populated with the three versions of the HumPRC™ Series module. The standard version has the standard module and an MMCX connector for use with the Master Development System. The “-CAS” version has an edge-mount RP-SMA connector for the antenna. The “-UFL” version uses the module’s on-board U.FL connector for the antenna.

## Ordering Information

| Ordering Information |                                                                                                                    |
|----------------------|--------------------------------------------------------------------------------------------------------------------|
| Part Number          | Description                                                                                                        |
| EVM-***-PRC          | HumPRC™ Series Carrier Board, Not Certified, Through-Hole Pin Interface, MMCX Connector for the Development System |
| EVM-***-PRC-CAS      | HumPRC™ Series Carrier Board, Certified, Through-Hole Pin Interface, RP-SMA Connector                              |
| EVM-***-PRC-UFL      | HumPRC™ Series Carrier Board, Certified, Through-Hole Pin Interface, U.FL Connector                                |
| HUM-***-PRC          | HumPRC™ Series Remote Control Transceiver, Castellation Interface, External Antenna Connection                     |
| HUM-***-PRC-CAS      | HumPRC™ Series Remote Control Transceiver, Certified, Castellation Interface, External Antenna Connection          |
| HUM-***-PRC-UFL      | HumPRC™ Series Remote Control Transceiver, Certified, Castellation Interface, U.FL Connector                       |
| MDEV-***-PRC         | HumPRC™ Series Master Development System                                                                           |
| MDEV-PGDOCK          | Development System Programming Dock                                                                                |
| MDEV-PROTO           | Development System Prototype Board                                                                                 |
| CON-SOC-EVM          | EVM Module Socket Kit                                                                                              |

\*\*\* = Frequency; 868, 900MHz

Figure 2: Ordering Information

## Absolute Maximum Ratings

| Absolute Maximum Ratings |      |    |                |     |
|--------------------------|------|----|----------------|-----|
| Supply Voltage $V_{CC}$  | -0.3 | to | +3.9           | VDC |
| Any Input or Output Pin  | -0.3 | to | $V_{CC} + 0.3$ | VDC |
| RF Input                 |      | 0  |                | dBm |
| Operating Temperature    | -40  | to | +85            | °C  |
| Storage Temperature      | -40  | to | +85            | °C  |

Exceeding any of the limits of this section may lead to permanent damage to the device. Furthermore, extended operation at these maximum ratings may reduce the life of this device.

Figure 3: Absolute Maximum Ratings



**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.

## Electrical Specifications

| HumPRC™ Series Transceiver Specifications |            |      |       |        |       |       |
|-------------------------------------------|------------|------|-------|--------|-------|-------|
| Parameter                                 | Symbol     | Min. | Typ.  | Max.   | Units | Notes |
| Power Supply                              |            |      |       |        |       |       |
| Operating Voltage                         | $V_{CC}$   | 2.0  |       | 3.6    | VDC   |       |
| TX Supply Current                         | $I_{CCTX}$ |      |       |        |       |       |
| at +10dBm                                 |            |      | 40.5  | 41.5   | mA    | 1,2   |
| at 0dBm                                   |            |      | 22    | 24     | mA    | 1,2   |
| RX Supply Current                         | $I_{CCRX}$ |      | 23.5  | 24.5   | mA    | 1,2,3 |
| Power-Down Current                        | $I_{PDN}$  |      | 0.7   | 1.4    | μA    | 1,2   |
| RF Section                                |            |      |       |        |       |       |
| Operating Frequency Band                  | $F_C$      |      |       |        | MHz   |       |
| EVM-900-PRC                               |            | 902  |       | 928    | MHz   |       |
| EVM-868-PRC                               |            | 863  |       | 870    | MHz   |       |
| RF Data Rate                              |            |      |       |        |       |       |
| EVM-900-PRC                               |            | 19.2 |       | 152.34 | kbps  |       |
| EVM-868-PRC                               |            |      | 38.4  |        | kbps  |       |
| Serial Data Rate                          |            | 9.6  |       | 115.2  | kbps  |       |
| Receiver Sensitivity                      |            |      |       |        |       | 5     |
| EVM-900-PRC @min rate                     |            | -98  | -101  |        | dBm   | 5     |
| EVM-900-PRC @max rate                     |            | -91  | -94   |        | dBm   | 5     |
| EVM-868-PRC                               |            | -97  | -100  |        | dBm   | 5     |
| Output Power                              | $P_O$      |      |       |        |       |       |
| EVM-900-PRC                               |            | +8.5 | +9.5  |        | dBm   | 6     |
| EVM-868-PRC                               |            | +8.5 | +10.6 |        | dBm   | 6     |
| Antenna Port                              |            |      |       |        |       |       |
| RF Impedance                              | $R_{IN}$   |      | 50    |        | Ω     | 4     |
| Environmental                             |            |      |       |        |       |       |
| Operating Temp. Range                     |            | -40  |       | +85    | °C    | 4     |

1. Measured at 3.3V  $V_{CC}$   
2. Measured at 25°C  
3. Input power < -60dBm  
4. Characterized but not tested  
5. PER = 5%  
6. Into a 50-ohm load

Figure 4: Electrical Specifications

Please see the HumPRC™ Series Transceiver module data guide for full electrical specifications.

## Pin Assignments

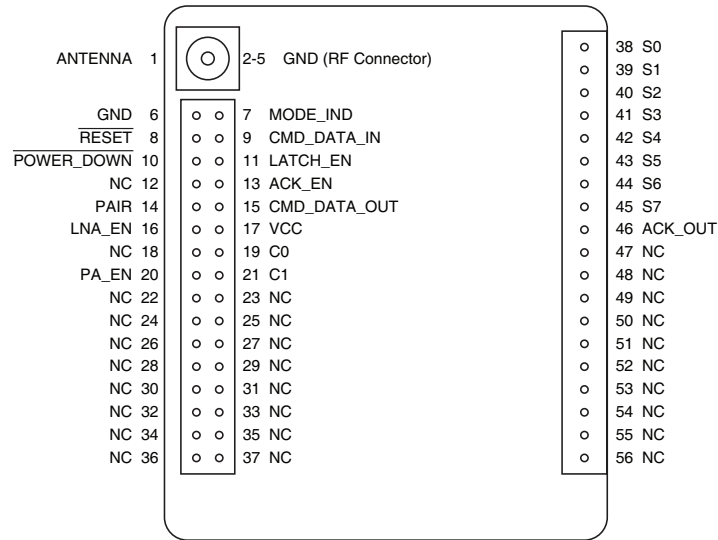


Figure 5: EVM-fff-PRC Pin Assignments

## Pin Descriptions

| Pin Descriptions |                    |     |                                                                                                                                                                                                                                         |
|------------------|--------------------|-----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Pin Number       | Name               | I/O | Description                                                                                                                                                                                                                             |
| 1                | ANTENNA            | —   | 50-ohm RF Antenna Port                                                                                                                                                                                                                  |
| 2, 3, 4, 5, 6    | GND                | —   | Ground                                                                                                                                                                                                                                  |
| 7                | MODE_IND           | O   | Mode Indicator. This line indicates module activity. It can source enough current to drive a small LED, causing it to flash. The duration of the flashes indicates the module's current state.                                          |
| 8                | RESET <sup>2</sup> | I   | This line resets the module when pulled low. It should be pulled high for normal operation.                                                                                                                                             |
| 9                | CMD_DATA_IN        | I   | Command Data In. Input line for the serial interface commands. If serial control is not used, this line should be tied to supply to minimize current consumption.                                                                       |
| 10               | POWER_DOWN         | I   | Power Down. Pulling this line low places the module into a low-power state. The module is not functional in this state. Pull high for normal operation. Do not leave floating.                                                          |
| 11               | LATCH_EN           | I   | If this line is high, then the status line outputs are latched (a received command to activate a status line toggles the output state). If low, then the output lines are momentary (active for as long as a valid signal is received). |

| Pin Descriptions     |                    |     |                                                                                                                                                                                                            |
|----------------------|--------------------|-----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Pin Number           | Name               | I/O | Description                                                                                                                                                                                                |
| 12, 18, 22–37, 47–56 | NC                 | —   | No Electrical Connection. Do not connect any traces to these lines.                                                                                                                                        |
| 13                   | ACK_EN             | I   | Pull this line high to enable the module to send an acknowledgement message after a valid control message has been received.                                                                               |
| 14                   | PAIR <sup>1</sup>  | I   | A high on this line initiates the Pair process, which causes two units to accept each other's transmissions. It is also used with a special sequence to reset the module to factory default configuration. |
| 15                   | CMD_DATA_OUT       | O   | Command Data Out. Output line for data and serial commands                                                                                                                                                 |
| 16                   | LNA_EN             | O   | Low Noise Amplifier Enable. This line is driven high when receiving. It is intended to activate an optional external LNA.                                                                                  |
| 17                   | VCC                | —   | Supply Voltage                                                                                                                                                                                             |
| 19                   | C0                 | I   | This line sets the input/output direction for status lines S0–S3. When low, the lines are outputs; when high they are inputs.                                                                              |
| 20                   | PA_EN              | O   | Power Amplifier Enable. This line is driven high when transmitting. It is intended to activate an optional external power amplifier.                                                                       |
| 21                   | C1                 | I   | This line sets the input/output direction for status lines S4–S7. When low, the lines are outputs; when high they are inputs.                                                                              |
| 38–45                | S0–S7 <sup>1</sup> | I/O | Status Lines. Each line can be configured as either an input to register button or contact closures or as an output to control application circuitry.                                                      |
| 46                   | ACK_OUT            | O   | This line goes high when the module receives an acknowledgement message from another module after sending a control message.                                                                               |

- These lines have an internal 20kΩ pull-down resistor
- These lines have an internal 10kΩ pull-up resistor

Figure 6: EVM-fff-PRC Pin Descriptions

## Schematic

Figure 7 shows the schematic diagram for the evaluation module.

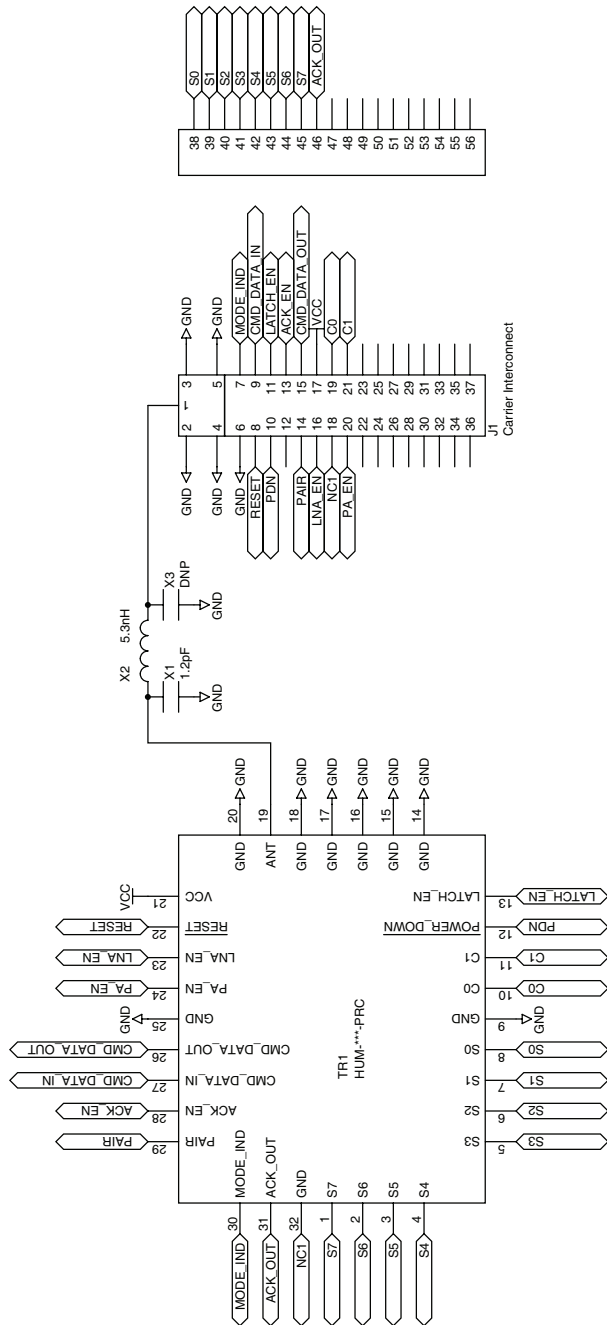


Figure 7: EVM-fff-PRC Schematic

## Pad Layout

Figure 8 shows the recommended PCB layout for the evaluation module.

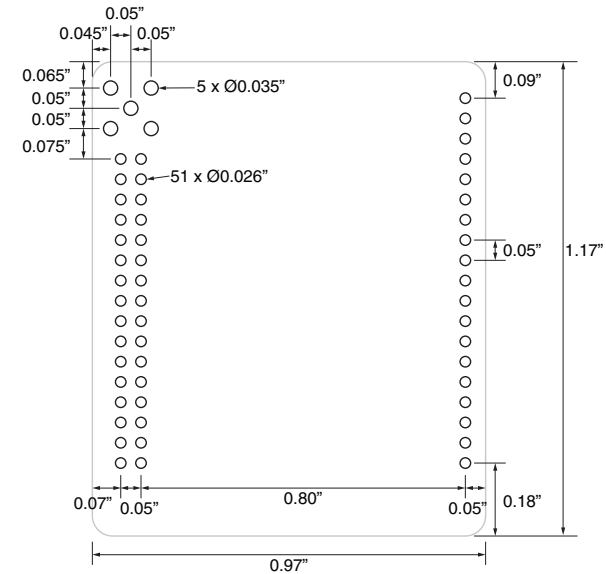


Figure 8: EVM-fff-PRC PCB Layout Dimensions

## Power Supply Requirements

The module does not have an internal voltage regulator, therefore it requires a clean, well-regulated power source. The power supply noise should be less than 20mV. 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.

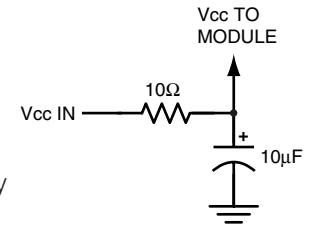


Figure 9: Supply Filter

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. 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.

Dimensions

The figures below show the dimensions for the three variants of the module.

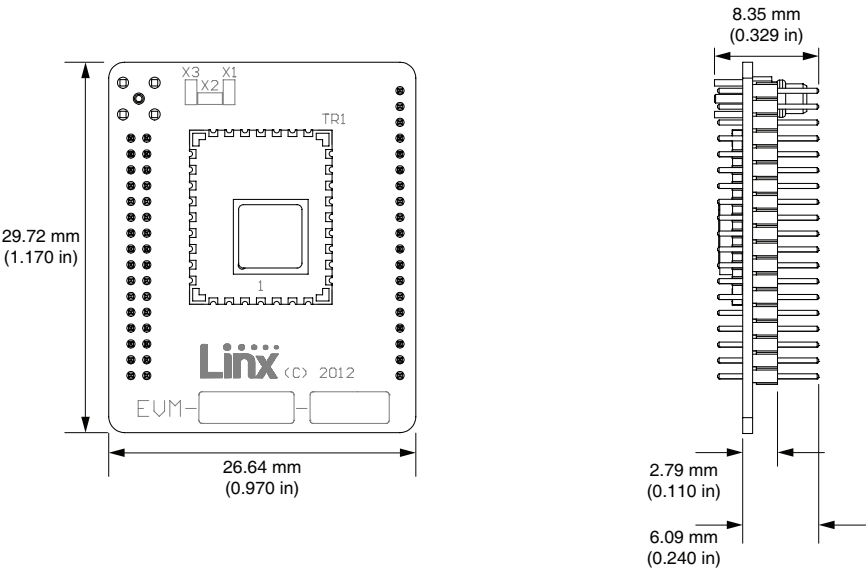


Figure 10: EVM-fff-PRC Dimensions

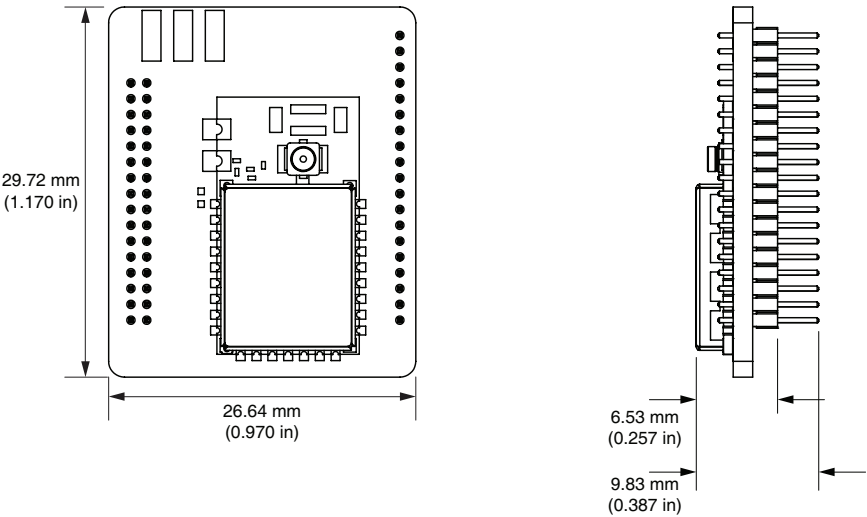


Figure 11: EVM-fff-PRC-UFL Dimensions

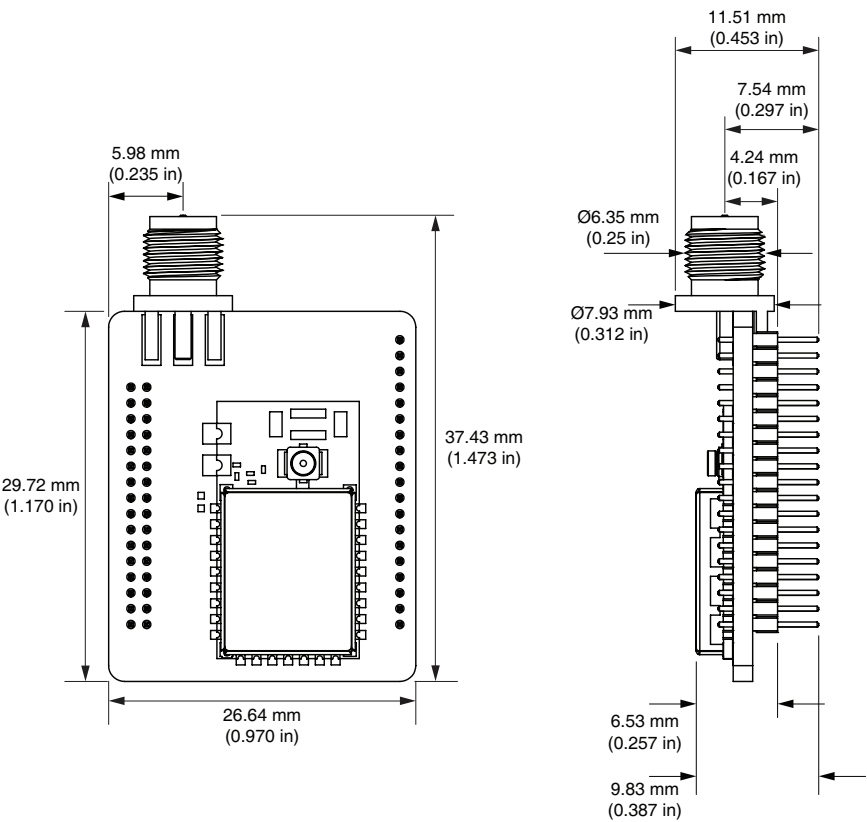


Figure 12: EVM-fff-PRC-CAS Dimensions





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