Linx TECHNOLOGIES

HumPRO™ Series Evaluation Module

Data Guide

Wireless made simple®

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").

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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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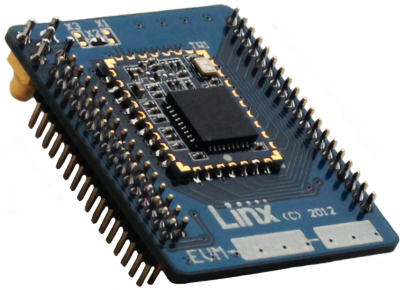

Figure 1: HumPRO™ Series Evaluation Module

Description

The HumPRO™ Series is a frequency hopping spread spectrum (FHSS) transceiver designed for the reliable transfer of digital data. It has a very fast lock time so that it can quickly wake up, send data and go back to sleep, saving power consumption in battery-powered applications that have strict power budgets.

The HumPRO™ Series module has several features that make the data transfer reliable. A Carrier Sense Multiple Access (CSMA) routine ensures that the channel is clear before the module begins transmitting data. Automatic acknowledgements ensure that the remote side got valid data. Multiple hopping patterns enable multiple systems to operate in proximity without interference. A standard UART interface is used for module configuration and data transfer.

All HumPRO™ Series modules have a unique 32-bit serial number that can be used as an address. Source and destination addressing support point-to-point and broadcast links. Address masking by the receiving module allows for creating subnets. More advanced networks can also be implemented.

The evaluation module contains the surface mount HumPRO™ Series transceiver module and an MMCX connector on a single board with through-hole headers. This small board simplifies prototyping with the HumPRO™ Series module.

Ordering Information

Ordering Information	
Part Number	**Description**
EVM-***-PRO	HumPRO™ Series Carrier Board
EVM-900-PRO-CAS	HumPRO™ Series Carrier Board with Certified module, Castellation Connection
EVM-900-PRO-UFL	HumPRO™ Series Carrier Board with Certified module, UFL Connector
HUM-***-PRO	HumPRO™ Series Data Transceiver
HUM-***-PRO-CAS	HumPRO™ Series Data Transceiver with Castellation Connection
HUM-***-PRO-UFL	HumPRO™ Series Data Transceiver with u.FL Connector
MDEV-***-PRO	HumPRO™ 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	ºC
Storage Temperature	–40	to	+85	ºC

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

HumPRO™ 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-PRO		902		928	MHz	
EVM-868-PRO		863		870	MHz	
RF Data Rate						
EVM-900-PRO		19.2		152.34	kbps	
EVM-868-PRO			38.4		kbps	
Serial Data Rate		9.6		115.2	kbps	
Receiver Sensitivity						5
EVM-900-PRO @min rate		–98	–101		dBm	5
EVM-900-PRO @max rate		–91	–94		dBm	5
EVM-868-PRO		–97	–100		dBm	5
Output Power	P_O					
EVM-900-PRO		+8.5	+9.5		dBm	6
EVM-868-PRO		+8.5	+10.6		dBm	6
Antenna Port						
RF Impedance	R_{IN}		50		Ω	4
Environmental						
Operating Temp. Range		–40		+85	ºC	4

1. Measured at 3.3V V_{CC}
2. Measured at 25ºC
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 HumPRO™ Series Transceiver module data guide for full electrical specifications.

Pin Assignments

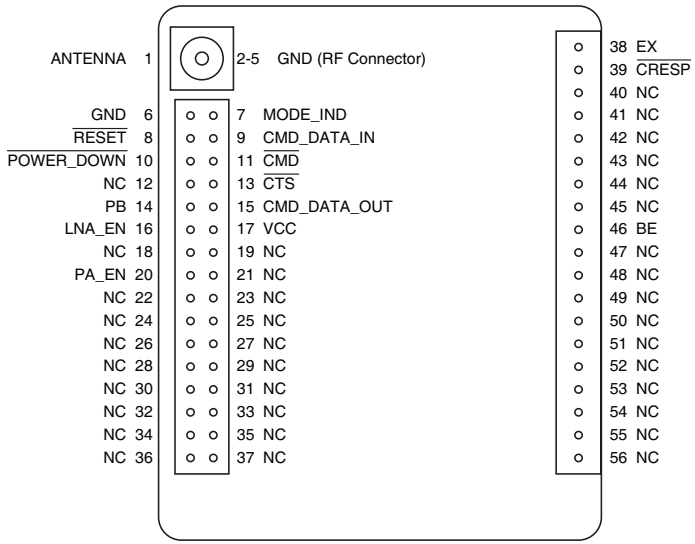

Figure 5: EVM-xxx-PRO Pin Assignments

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	$\overline{\text{RESET}}$	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 data ($\overline{\text{CMD}}$ is high) and serial commands (CMD is low).
10	$\overline{\text{POWER\_DOWN}}$	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	$\overline{\text{CMD}}$	I	Command Input. When this line is low, incoming bytes are command data. When high, incoming bytes are data to be transmitted.
12, 18, 19, 21–37, 40-56	NC	—	No Electrical Connection. Do not connect any traces to these lines.

Pin Descriptions

Pin Number	Name	I/O	Description
13	$\overline{\text{CTS}}$	O	UART Clear To Send, active low. This line indicates to the host microcontroller when the module is ready to accept data. When CTS is high, the module is busy. When CTS is low, the module is ready for data.
14	PB	I	Reset non-volatile memory. A sequence of 4 high pulses on this line, followed by a prolonged high state causes the module to reset the non-volatile configuration parameters to factory default values.
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
20	PA_EN	O	Power Amplifier Enable. This line is driven high when transmitting. It is intended to activate an optional external power amplifier.
38	EX	O	Exception Output. A mask can be set to take this line high when an exception occurs. The line is lowered when the exception register is read (EXCEPT).
39	$\overline{\text{CRESP}}$	O	Command Response. This line is low when the data on the CMD_DATA_OUT line is a response to a command and not data received over the air.
46	BE	O	Buffer Empty. This line is high when the UART input buffer is empty, indicating that all data has been transmitted. If acknowledgment is active, it also indicates that the receiving module has acknowledged the data or a retry exception has occurred.

Figure 6: EVM-xxx-PRO Pin Descriptions

Schematic

Figure 7 shows the schematic diagram for the evaluation module.

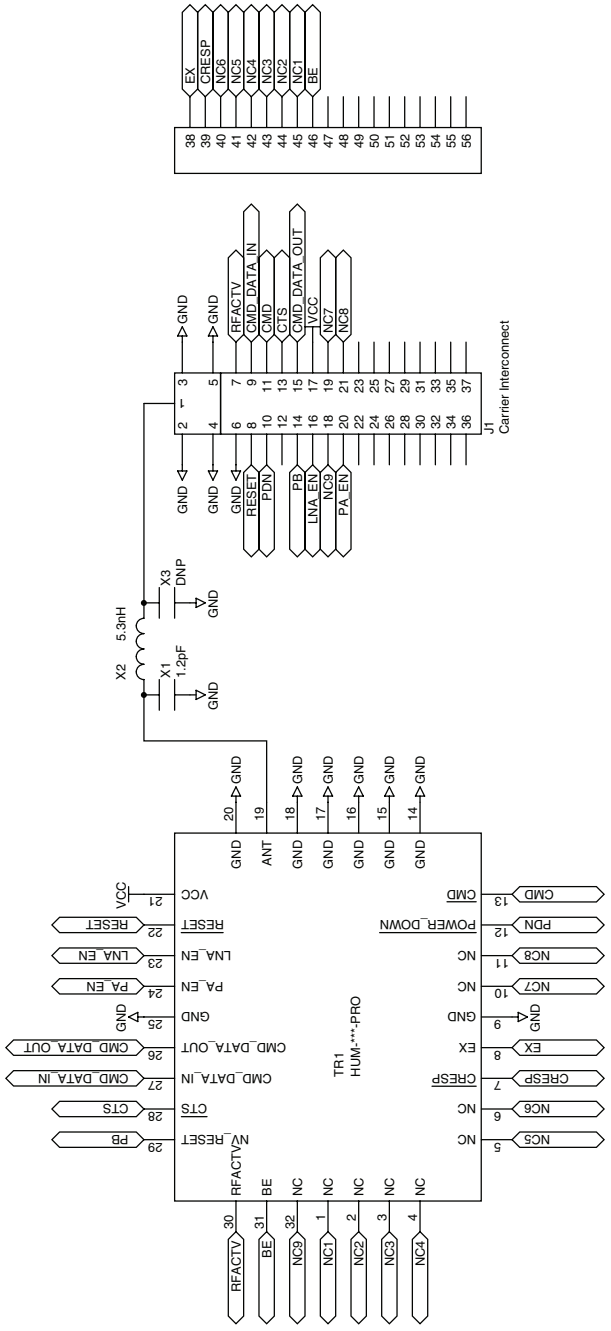

Figure 7: EVM-xxx-PRO Schematic

Pad Layout

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

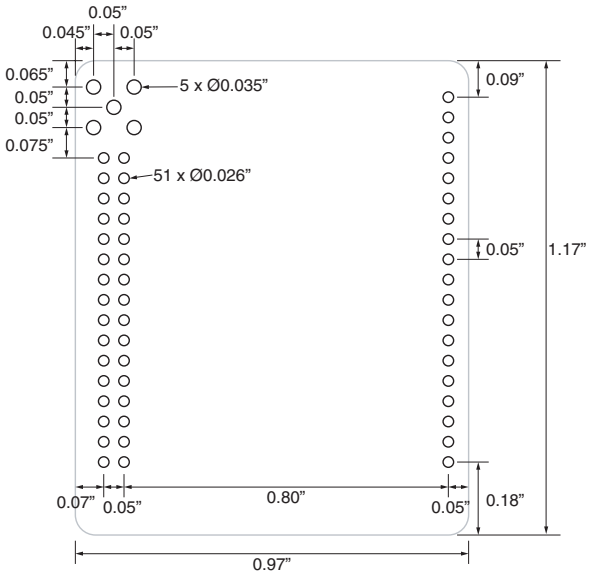

Figure 8: EVM-xxx-PRO PCB Layout Dimensions

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.

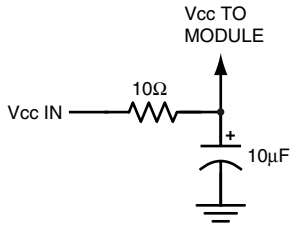

Figure 9: Supply Filter

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.

Linx Technologies
159 Ort Lane
Merlin, OR, US 97532

Phone: +1 541 471 6256
Fax: +1 541 471 6251

www.linxtechnologies.com

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Адрес: 105318, г.Москва, ул.Щербаковская д.3, офис 1107

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Офис по работе с юридическими лицами:

105318, г.Москва, ул.Щербаковская д.3, офис 1107, 1118, ДЦ «Щербаковский»

Телефон: +7 495 668-12-70 (многоканальный)

Факс: +7 495 668-12-70 (доб.304)

E-mail: info@moschip.ru

Skype отдела продаж:
moschip.ru
moschip.ru_4
moschip.ru_6
moschip.ru_9