Linx TECHNOLOGIES

HumRC™ 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").

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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Figure 1: HumRC™ Series Evaluation Module

Description

The HumRC™ Series transceiver is designed for reliable bi-directional remote control applications. It consists of a highly optimized Frequency Hopping Spread Spectrum (FHSS) RF transceiver and integrated remote control transcoder. The FHSS system allows higher RF output power and, therefore, longer range than narrowband radios.

Eight status lines can be set up in any combination of inputs and outputs for the transfer of button or contact states. A selectable acknowledgement indicates that the transmission was successfully received. Versions are available in the 2400 to 2483MHz frequency bands.

Primary settings are hardware-selectable, which eliminates the need for an external microcontroller or other digital interface. For advanced features, optional software configuration is provided by a UART interface; however, no programming is required for basic operation.

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

Ordering Information

Ordering Information	
Part Number	**Description**
EVM-***-RC	HumRC™ Series Carrier Board
HUM-***-RC	HumRC™ Series Remote Control Transceiver
HUM-***-RC-MWA	HumRC™ Series Remote Control Transceiver with Antenna
HUM-***-RC-MWC	HumRC™ Series Remote Control Transceiver with Connector
MDEV-***-RC	HumRC™ Series Master Development System
EVAL-***-RC	HumRC™ Series Basic Evaluation Kit
MDEV-DEMO-RC-A	Development System Remote Control Demo Board, Type A
MDEV-DEMO-RC-B	Development System Remote Control Demo Board, Type B
MDEV-PGDOCK	Development System Programming Dock
MDEV-PROTO	Development System Prototype Board
CON-SOC-EVM	EVM Module Socket Kit

*** = Frequency; 900MHz, 2.4GHz

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.

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

Electrical Specifications

HumRC™ Series Transceiver Specifications						
Parameter	**Symbol**	**Min.**	**Typ.**	**Max.**	**Units**	**Notes**
Power Supply						
Operating Voltage	V_{CC}	2.0		3.6	VDC	
Peak TX Supply Current	I_{CCTX}					
2.4GHz at +1dBm			28	29	mA	1,2
2.4GHz at –10dBm			19	20	mA	1,2
900MHz at +10dBm			36	38.5	mA	1,2
900MHz at 0dBm			22	24	mA	1,2
Average TX Supply Current						
2.4GHz at +1dBm			22	24	mA	1,2
900MHz at +10dBm			27.5	28.5	mA	1,2
RX Supply Current	I_{CCRX}		25.5	28	mA	1,2,3
Standby Current	I_{SBY}		0.5	1.4	µA	1,2
Power-Down Current	I_{PDN}		0.5	1.4	µA	1,2
RF Section						
Operating Frequency Band	F_C				MHz	
HUM-2.4-RC		2400		2483.5	MHz	
HUM-900-RC		902		928	MHz	
Number of Channels			25			
Receiver Sensitivity						5
HUM-2.4-RC		–95	–99		dBm	5
HUM-900-RC		–94	–98		dBm	5
Output Power	P_O					
HUM-2.4-RC		0	+1		dBm	6
HUM-900-RC		+8.5	+9.5		dBm	6
Antenna Port						
RF Impedance	R_{IN}		50		Ω	4
Environmental						
Operating Temp. Range		–40		+85	ºC	4
Timing						
IU to RU Status High				50	ms	7

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
7. No RF interference

Figure 4: Electrical Specifications

Pin Assignments

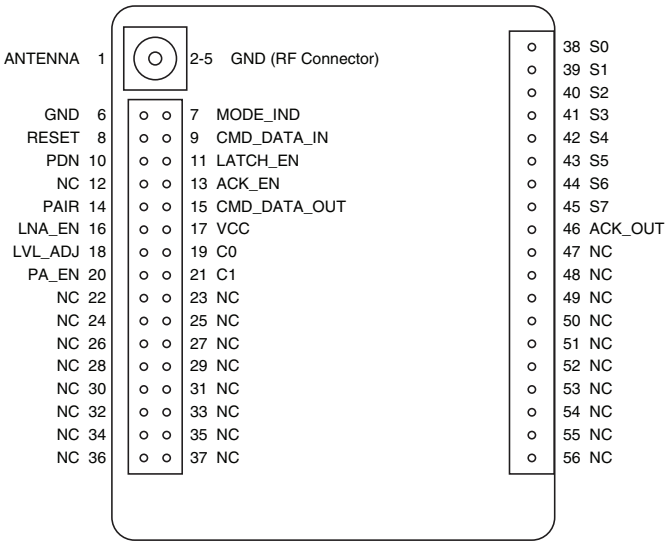

Figure 5: EVM-xxx-RC Pin Assignments

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	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 the serial interface commands. If serial control is not used, this line should be tied to ground or $\overline{\text{POWER\_DOWN}}$ to minimize current consumption.
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	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 this line is 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, 22–25, 26–37, 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[1]	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 the serial interface commands
16	LNA_EN	0	Low Noise Amplifier Enable. This line is driven high when receiving. It is intended to activate an optional external LNA.
17	VCC	—	Supply Voltage
18	LVL_ADJ	I	Level Adjust. The voltage on this line sets the transmitter output power level.
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[1]	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.

1. These lines have an internal 20kΩ pull-down resistor

Figure 6: EVM-xxx-RC Pin Descriptions

Schematic

Figure 7 shows the schematic diagram for the evaluation module.

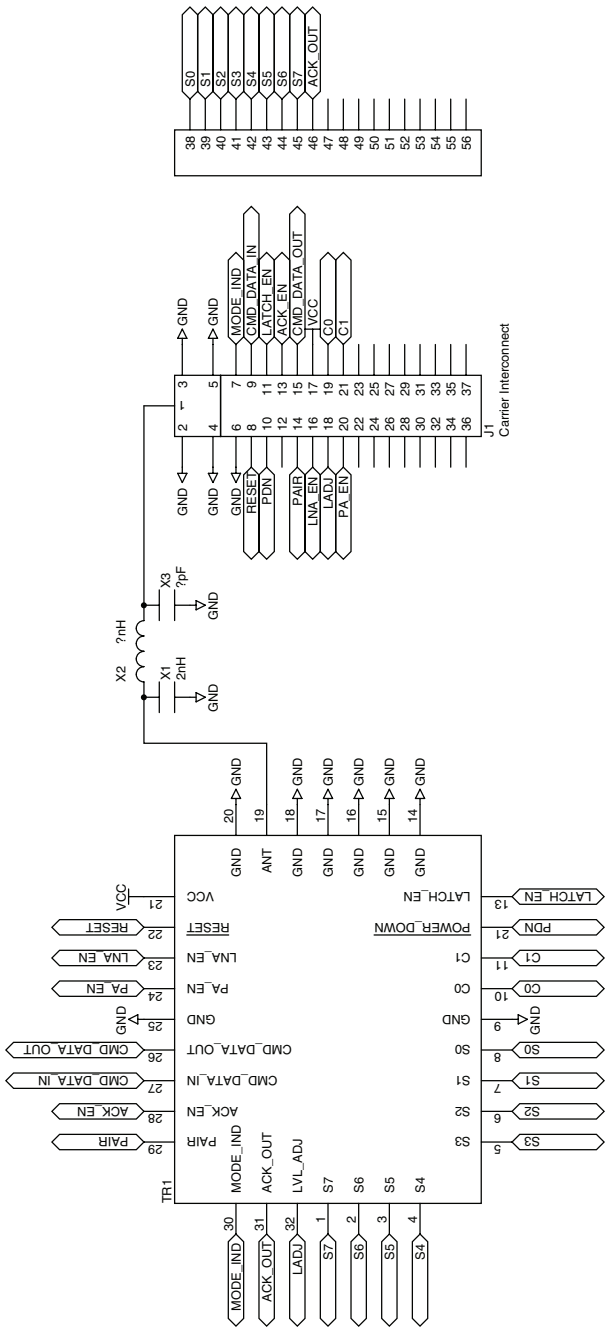

Figure 7: EVM-xxx-RC Schematic

Pad Layout

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

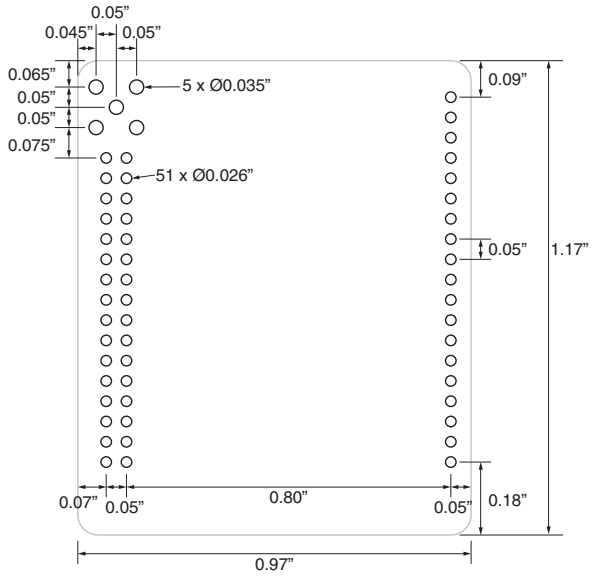

Figure 8: EVM-xxx-RC PCB Layout Dimensions

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.

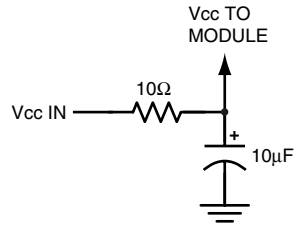

Figure 9: Supply Filter

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.

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