



**HumRC™ Series**  
**Evaluation Module**  
**Data Guide**

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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.

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# Table of Contents

- 1 [Description](#)
- 2 [Ordering Information](#)
- 2 [Absolute Maximum Ratings](#)
- 3 [Electrical Specifications](#)
- 4 [Pin Assignments](#)
- 4 [Pin Descriptions](#)
- 6 [Schematic](#)
- 7 [Pad Layout](#)
- 7 [Power Supply Requirements](#)

# HumRC™ Series Evaluation Module

## Data Guide



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	°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.

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	$I_{CCRFX}$		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	°C	4
Timing						
IU to RU Status High				50	ms	7

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
7. No RF interference

Figure 4: Electrical Specifications

## Pin Assignments

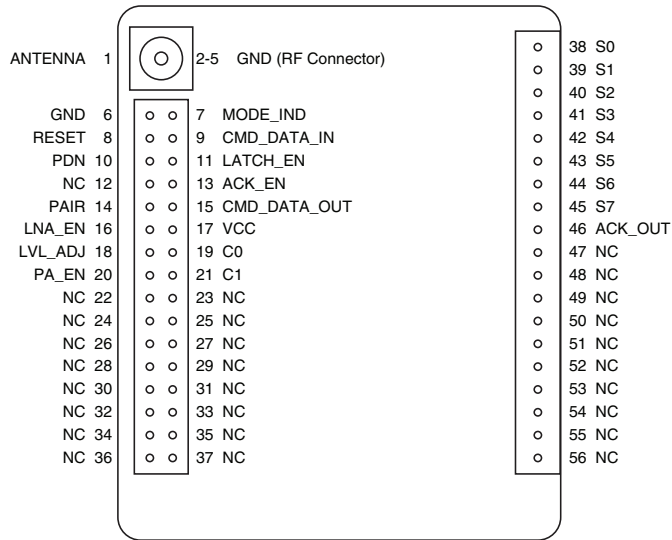


Figure 5: EVM-xxx-RC Pin Assignments

## 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 <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 the serial interface 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
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 <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.

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.

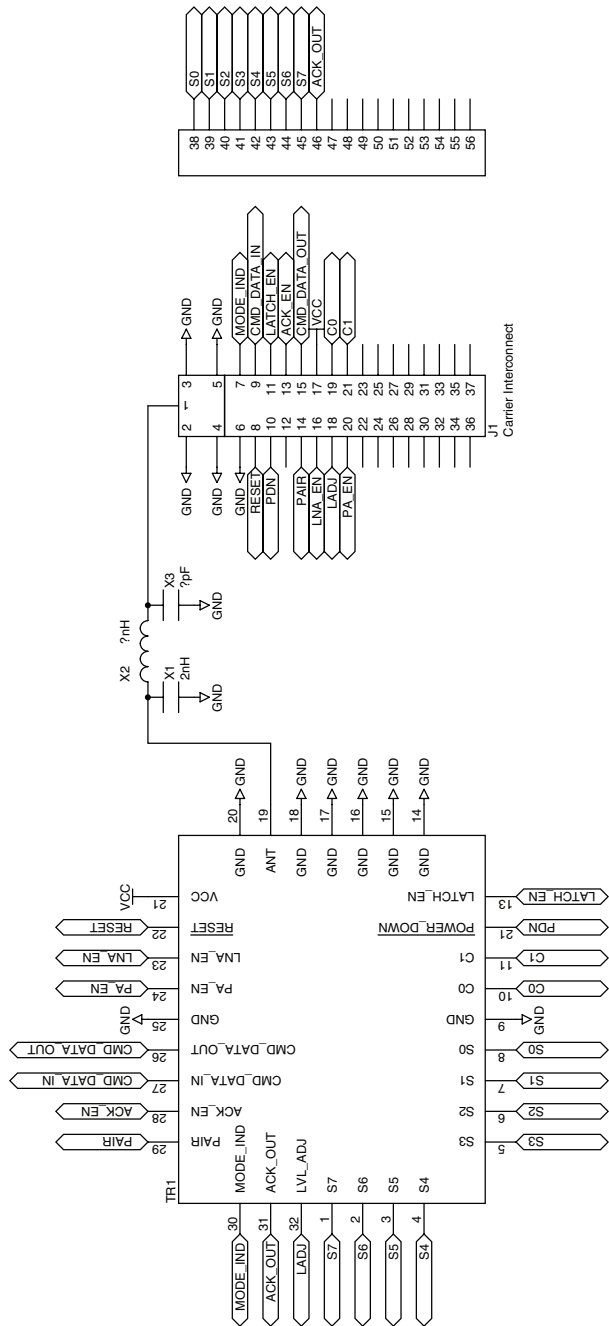


Figure 7: EVM-xxx-RC Schematic

## Pad Layout

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

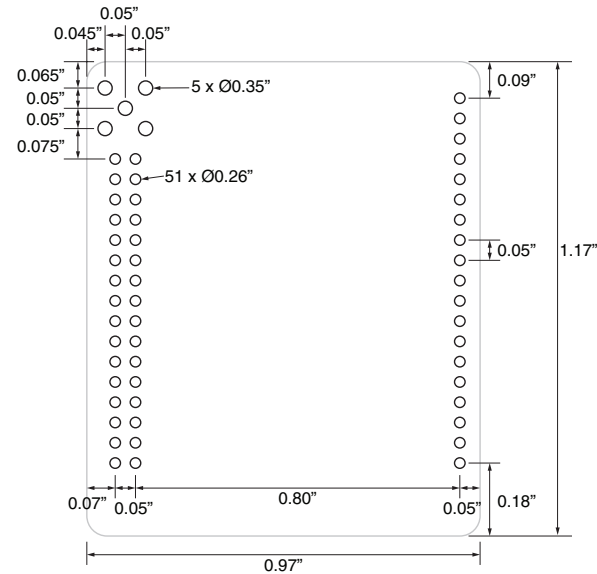


Figure 8: EVM-xxx-RC PCB Layout Dimensions

## 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.

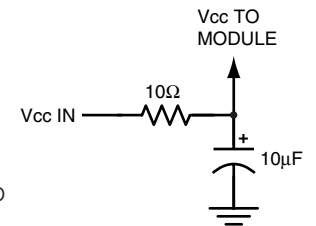


Figure 9: Supply Filter

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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