RADIO MODULE
MRX-010

UHF AM RECEIVER MODULE

PRELIMINARY
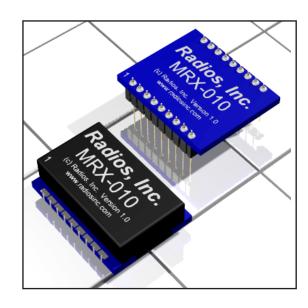
DATA SHEET

Radios, Inc.

November 7, 2007 Preliminary Data Sheet

MRX-010

UHF AM RECEIVER MODULE

The MRX-010 is an ASK/OOK (ON-OFF Keyed) RF receiver that operates at 315, 390, 418, and 433 MHz, and is primarily intended for use in part 15.231 systems. The receiver is recommended for new designs replacing the MRX-007. It provides the same function with sensitivity enhancement, typically 6dB better than the MRX-007. Just like all other members of the Radios, Inc. Micrel RF Module family, the MRX-010 achieves low power operation, a very high level of integration, and it is particularly easy to use.

All post-detection data filtering is provided on the MRX-010, so no external baseband filters are required. An external antenna is the only component required, therefore the receiver can be easily integrated into other applications.

The MRX-010 works in fixed-mode operation, which functions as a conventional super-heterodyne receiver. Fixed-mode provides better selectivity and sensitivity performance in comparison with sweep mode used in other Radios, Inc. receivers intended for lower cost applications.

Key Features

- High sensitivity
- 300MHz to 440MHz frequency range
- Supports On-Off Keying
- Low power consumption
- Compact surface-mount packages
- Data rates up to 2.0 kbps
- Small size
- Shutdown input
- No production tuning

Typical Applications

- Remote controls
- Garage openers / Gate controls
- Keyless entry
- Remote fan and lighting control
- Long range RF identification
- General wire elimination

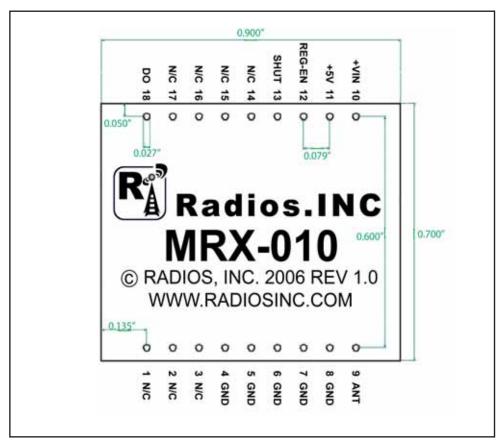| Contact Information	
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1408 Center Avenue	Fax: 920-564-6630
Oostburg, WI 53070	Email: sales@radiosinc.com

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Mechanical and Pin Diagram
DIP Package

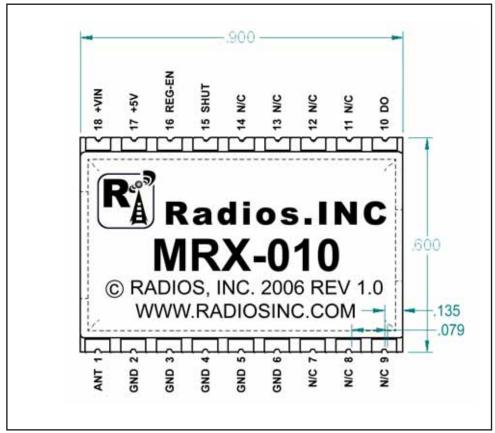* Note: Pinouts of surface mount and through-hole packages are mirrored

DIP Package

Pin Description					
Pin Num	**Pin Name**	**Description**	**Pin Num**	**Pin Name**	**Description**
Pin 1	N/C	No Connect	Pin 10	+VIN	Positive Supply Pin (5-16V)
Pin 2	N/C	No Connect	Pin 11	+5V	Regulated Output (5V)
Pin 3	N/C	No Connect	Pin 12	REG-EN	Regulator Enable (2-VCC)
Pin 4	Gnd	Ground	Pin 13	SHUT	Shutdown (0-5V)
Pin 5	Gnd	Ground	Pin 14	N/C	No Connect
Pin 6	Gnd	Ground	Pin 15	N/C	No Connect
Pin 7	Gnd	Ground	Pin 16	N/C	No Connect
Pin 8	Gnd	Ground	Pin 17	N/C	No Connect
Pin 9	Ant	RF Input (50 Ohms)	Pin 18	DO	Data Output (0-5V)

** Verify pin configurations are correct before connecting power or resulting damage may occur.

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Mechanical and Pin Diagram
Surface Mount Package

* Note: Pinouts of surface mount and through-hole packages are mirrored
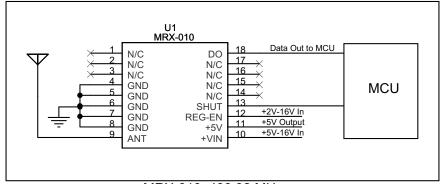

Surface Mount Package

Pin Num	Pin Name	Description	Pin Num	Pin Name	Description
**Pin Description**					
Pin 1	ANT	RF Input (50 Ohms)	Pin 10	DO	Data Output (0-5V)
Pin 2	GND	Ground	Pin 11	N/C	No Connect
Pin 3	GND	Ground	Pin 12	N/C	No Connect
Pin 4	GND	Ground	Pin 13	N/C	No Connect
Pin 5	GND	Ground	Pin 14	N/C	No Connect
Pin 6	GND	Ground	Pin 15	SHUT	Shutdown (0-5V)
Pin 7	N/C	No Connect	Pin 16	REG-EN	Regulator Enable (2-VCC)
Pin 8	N/C	No Connect	Pin 17	+5V	Regulated Output (5V)
Pin 9	N/C	No Connect	Pin 18	+VIN	Positive Supply Pin (5-16V)

** Verify pin configurations are correct before connecting power or resulting damage may occur.

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Pin Detail			
Pin Number		**Pin Name**	**Description**
DIP	**Surface Mount**		
9	1	Ant	This is the receive RF input, internally ac-coupled. Connect this pin to the receive antenna.
4,5,6,7,8	2,3,4,5,6	Gnd	Ground
1,2,3,14,15, 16,17	7,8,9,11,12, 13,14	N/C	No Connect
18	10	DO	Output data pin. CMOS level compatible.
13	15	SHUT	Shutdown mode logic-level input. Pull low to enable receiver. This pin is internally pulled-up to VCC.
12	16	REG-EN	In a regulated module, this pin powers on the module with a 2-16V supply input. Pulling this pin low disables module. In a non-regulated module, this is a no connect.
11	17	+5V	In a regulated module, this is a 5V output from the onboard regulator when REG-EN is high (2-16V). In a non-regulated module, this is the 4.75V to 5.5V power supply input.
10	18	+VIN	In a regulated module, this is the power supply pin of the module. Input 5-16V to power a regulated module. In a non-regulated module, this is a no connect.

Typical Application Schematic

MRX-010, 433.92 MHz

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Electrical Limits

Sym	Parameters	Min	Typ	Max	Unit	Notes
	Absolute Maximum Ratings					
VCC	Supply Voltage - Regulated	5		16	V	
	Supply Voltage - Not Regulated	4.75		5.5	V	
	Storage Temperature Range	0		70	°C	
V_{EN}	Enable Input Voltage	0		16	V	
	Operating Ratings					
V_{EN}	Enable Input Voltage	0		VCC	V	
TA	Ambient operating temperature	0		70	°C	

Electrical Characteristics

This device is ESD sensitive. Do not operate or store near strong electrostatic fields. Use appropriate ESD precautions. All voltages are with respect to Ground.

Parameters	Test Conditions	Min	Typ	Max	Unit
Power Supply					
Operating Current	433.92 MHz		4		mA
Standby Current	V_{SHUT} = 0.8VCC		0.15	0.5	µA
Operating Voltage	Regulated	5		16	V
	Not Regulated	4.75		5.5	V
RF/IF Section					
Receiver Sensitivity	f_{RF} = 315 MHz, Note 1		-105		dBm
	f_{RF} = 433.92 MHz, Note 1		-103		dBm
RF Frequency Range		300		440	MHz
Data Rate			600		bps
IF Center Frequency			0.86		MHz
IF 3dB Bandwidth			0.6		MHz
Spurious Reverse Isolation	ANT pin, Rsc = 50Ω Note 2		30		µVrms
AGC Attack / Decay ratio	T(Attack) / T(Decay)		0.1		
AGC Leakage Current	T_A = +85°		±100		nA
Digital Section					
Output Current	DO pin, Push-Pull		45		µA
Output High Voltage	DO pin, Iout = -30µA	0.9VCC			V
Output Low Voltage	DO pin, Iout = +30µA			0.1VCC	V
Output Rise and Fall Time	DO pin, Cload=15pF		4		µsec
Regulator Enable Input					
Input Low Voltage	Regulator OFF			0.6	V
Input High Voltage	Regulator ON	2.0			V
Enable Input Current	REG-EN = 0.6V; Regulator OFF		0.01		µA

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Electrical Characteristics - CONT.

Note 1: Sensitivity is defined as the average signal level measured at the input necessary to achieve 10e-2 Bit Error Rate (BER). The RF input is assumed to be matched into 50 ohms.

Note 2: Spurious reverse isolation represents the spurious components which appear on the RF input (ANT) pin measured into 50 ohms with an input RF matching network.

Note 3: Exceeding the absolute maximum ratings may damage the device.

Note 4: The device is not guaranteed to function outside its operating ratings.

PRELIMINARY

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Technical Support:

Radios, Inc. is committed to providing its customers with excellent technical support and the resources necessary to assist them with their product development. All technical support is provided free of charge. Customers have several options to obtain assistance. First, any questions or concerns can be e-mailed to Radios, Inc. at information@radiosinc.com. We monitor our e-mail daily, and will respond to all questions promptly. Additionally, to speak directly to a technical support representative, customers can call Radios, Inc. at 920-564-6622.

Compliance:

Embedded wireless modules are intended for use as component devices which require peripheral elements to operate. Radios, Inc.'s modules are intended to be used in products requiring compliance. They are, however, not pre-approved by the FCC or any other agency worldwide unless so stated. The user or customer understands that regulatory compliance may be required prior to the sale or operation of the module or development system, and agrees to abide by all laws governing the module's or development system's use in the country of operation.

The approval process of embedded wireless modules in the United States is relatively uncomplicated. The Federal Communications Commission (FCC) is the governing body in the US that specifies its requirements in the Code of Federal Regulations (CFR), Title 47. Title 47 consists of several volumes and it is necessary to first identify the correct section that applies to your application. These rules require that a device which intentionally creates RF emissions be FCC compliant; i.e., pre-tested for compliance and assigned an identification number. Radios, Inc. offers pre-screening at one of our affiliate test sites. Final certification is then accomplished by an independent test laboratory. After passing compliance testing, you will be issued a unique ID number which must be placed on each product manufactured.

Any questions dealing with interpretations of the rules relating to testing or compliance should be addressed to:

<div align="center">

FCC
Equipment Authorization Division
Customer Service Branch, MN 1300F2
7435 Oakland Mills Road
Columbia, MD 21046

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Returns:

Products may be returned directly to Radios, Inc. for evaluation. Returns, without exception, must have a valid RMA number attached. RMA numbers can be obtained by calling a customer service representative at Radios, Inc. If a product is found to be defective and is returned within 90 days of purchase, Radios, Inc. may repair or replace, at its option, said defective product. The warranty does not apply to any products which have been disassembled, modified or subjected to conditions exceeding the application specifications. Under no circumstances will Radios, Inc. be responsible for losses, financial or other, arising from the use or failure of a device in an application or for losses arising from failure to meet delivery requirements, other than the repair, replacement, or refund limited to the original product purchase price. No other warranties, express, implied, or statutory, including warranty of fitness for a particular purpose, apply.

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Editorial Information:

(Date)

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Product Ordering Information:

MRX-010 - 433 D 600 SQ R A - B

Field	Code
Packaging:	B - Bulk
	TB - Tube
	TR - Tape and Reel
Antenna:	A - Antenna
	- No Antenna
Voltage Regulation:	R - Regulated
	- Not Regulated
Squelched:	SQ - Squelched
	- Not Squelched
Baud Rate:	600 = 600 bps
	= 1200 bps
Package:	D - Through-hole
	S - Surface Mount
	SC - Surface Mount with Cap
Frequency: (based on module's frequency range)	310 = 310 MHz
	315 = 315 MHz
	390 = 390 MHz
	418 = 418 MHz
	433 = 433.92 MHz
	XXX = Custom Frequency