

RADIO MODULE
MXR-ND9E5

GFSK TRANSCEIVER MODULE

PRELIMINARY

DATA SHEET

Radios, Inc.

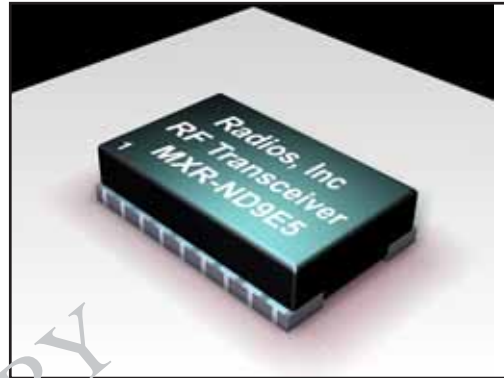
April 28, 2006 Preliminary Data Sheet

MXR-ND9E5

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The MXR-ND9E5 is a fully integrated RF transceiver with a 8051 compatible microcontroller and a 4 input 10bit 80ksps AD converter. The circuit has embedded voltage regulators, which provides maximum noise immunity and allows operation on a single 2.7V to 16V supply. The MXR-ND9E5 is compatible with FCC standard CFR47 part 15 and ETSI EN 300 220-1.

The MXR-ND9E5 is a radio transceiver for the 433/868/915 MHz ISM bands. The transceiver consists of a fully integrated frequency synthesizer, a power amplifier, a modulator and a receiver unit. Output power and frequency channels and other RF parameters are easily programmable by use of the on chip SPI interface. RF current consumption is only 9 mA in TX mode (output power -10dBm) and 12.5 mA in RX mode. For power saving the transceiver can be turned on / off under software control.



Key Features

- 8051 compatible microcontroller
- 4 input, 10bit 80ksps ADC
- 2.7V to 16V supply
- Internal VDD monitoring
- 2.5µA standby with wakeup on timer or external pin
- Adjustable output power up to 10dBm
- Channel switching time less than 650µs
- Low TX supply current, typical 9mA @-10dBm
- Low RX supply current typical 12.5mA peak
- Low MCU supply current, typ. 1mA at 4MHz @3volt
- Suitable for frequency hopping
- Carrier Detect for “listen before transmit protocol”

Typical Applications

- Sports and leisure equipment
- Alarm and security system
- Industrial sensors
- Remote control
- Surveillance
- Automotive
- Telemetry
- Keyless entry
- Toys

PRODUCT ORDER INFORMATION

Part Number	Description
MXR-ND9E5-433(D)(S)	433 MHZ GFSK Module Transceiver
MXR-ND9E5-868(D)(S)	868 MHZ GFSK Module Transceiver
MXR-ND9E5-915(D)(S)	915 MHZ GFSK Module Transceiver

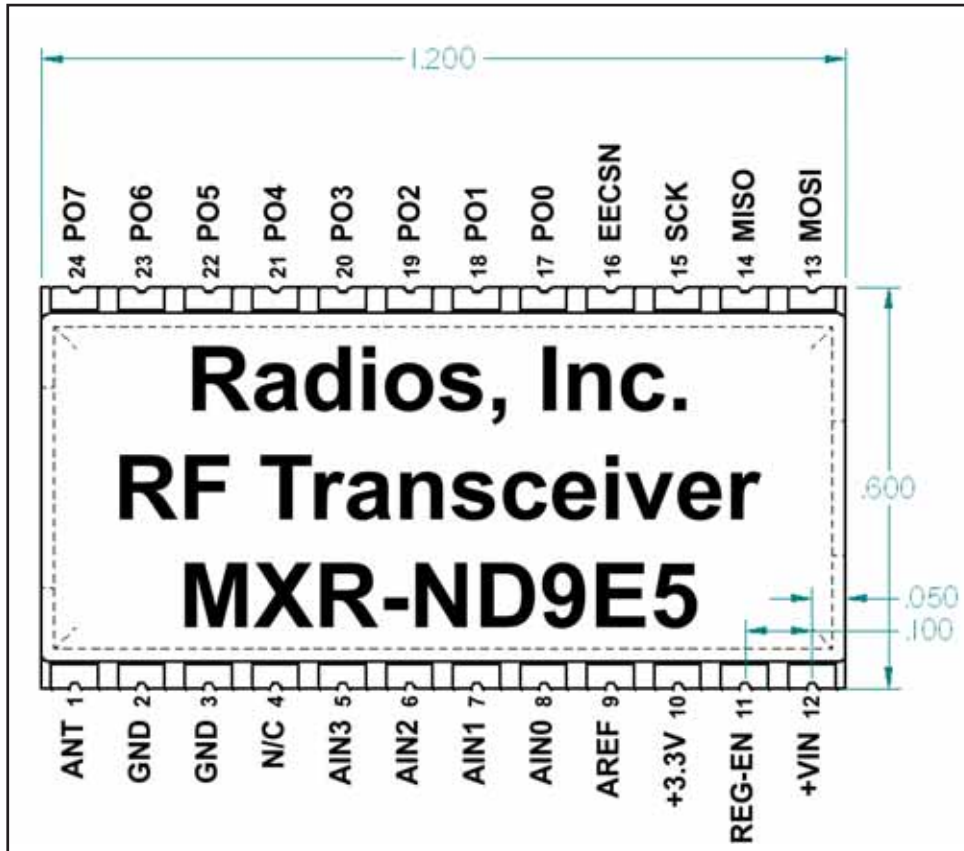
Contact Information

Radios, Inc. P.O. Box 1304 North Wales, PA 19454	Phone: 215-362-1899 Fax: 215-362-2214 Email: sales@radiosinc.com
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Mechanical and Pin Diagram



Pin Description

Pin Num	Pin Name	Description	Pin Num	Pin Name	Description
Pin 1	Ant	RF Input	Pin 13	MOSI	SPI Output
Pin 2	Gnd	Ground	Pin 14	MISO	SPI Input
Pin 3	Gnd	Ground	Pin 15	SCK	SPI Clock
Pin 4	N/C	No Connect	Pin 16	EECSN	SPI Enable, Active Low
Pin 5	AIN3	Analog Input Pin	Pin 17	PO0	Digital I/O Pin
Pin 6	AIN2	Analog Input Pin	Pin 18	PO1	Digital I/O Pin
Pin 7	AIN1	Analog Input Pin	Pin 19	PO2	Digital I/O Pin
Pin 8	AIN0	Analog Input Pin	Pin 20	PO3	Digital I/O Pin
Pin 9	AREF	ADC Reference Voltage	Pin 21	PO4	Digital I/O Pin
Pin 10	+3.3V	Regulated Output	Pin 22	PO5	Digital I/O Pin
Pin 11	REG-EN	Regulator Enable	Pin 23	PO6	Digital I/O Pin
Pin 12	+VIN	Positive Supply Pin	Pin 24	PO7	Digital I/O Pin

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Electrical Limits

Sym	Parameters	Min	Typ	Max	Unit	Notes
	Absolute Maximum Ratings					
VDD	Supply Voltage	-20		20	V	
	Storage Temperature Range	-65		150	°C	
	Lead Temperature		260		°C	
V _{EN}	Enable Input Voltage	-20		20	V	
	ESD Rating		TBD		kV	
	Operating Ratings					
	Package Thermal Resistance		220		°C/W	
V _{EN}	Enable Input Voltage	0		16	V	
TA	Ambient operating temperature	-40		85	°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
RF Conditions					
RF Operating Frequency	Note 6	430		928	MHz
Frequency Deviation		±42	±50	±58	kHz
Data Rate	Note 7		50		kbps
Channel Spacing	433 MHz		100		kHz
	868/915 MHz		200		kHz
Quiescent Current			TBD		µA
Supply Current	Power Down Mode, Note 4		2.5		µA
Digital Input/Output					
High Level Input Voltage		0.7VDD		VDD	V
Low Level Input Voltage		VSS		0.3VDD	V
High Level Output Voltage		VDD-0.3		VDD	V
Low Level Output Voltage		VSS		0.3	V
Microcontroller Conditions					
Supply Current	4 MHz, 3V		1		mA
High Drive Sink Current	for PO6, PO4, PO2 & PO0, Note 5			10	mA
High Drive Source Current	for PO7, PO5, PO3 & PO1, Note 5			10	mA
Low Power RC Oscillator Frequency		1		5.5	kHz
Transmitter Operation					
Output Power	10dBm, Note 8	7	10	11	dBm
	6dBm, Note 8	3	6	9	dBm
	-2dBm, Note 8	-6	-2	2	dBm
	-10dBm, Note 8	-14	-10	-6	dBm
20dB Bandwidth for Modulated Carrier	Note 7		190		kHz
1st Adjacent Channel Transmit Power	Note 9		-27		dBc
2nd Adjacent Channel Transmit Power	Note 9		-54.0		dBc
Supply Current	10dBm Output Power		30		mA
	-10dBm Output Power		9		mA

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Electrical Characteristics - CONT.

Receiver Operation					
Supply Current	In Receive Mode		12.5		mA
Sensitivity	at 0.1%BER		-100		dBm
Maximum Received Signal		0			dBm
C/I Co-channel	Note 10		13		dB
1st Adjacent Channel Selectivity	C/I 200kHz, Note 10		-7		dB
2nd Adjacent Channel Selectivity	C/I 400kHz, Note 10		-13		dB
Blocking	+1 MHz, Note 10		-40		dB
	-1 MHz, Note 10		-50		dB
	-2 MHz, Note 10		-63		dB
	+5 MHz, Note 10		-70		dB
	-5 MHz, Note 10		-65		dB
	+10 MHz, Note 10		-69		dB
Blocking	-10 MHz, Note 10		-67		dB
	Image Rejection	Note 10	-36		dB
ADC Operation					
Differential Nonlinearity			±0.5		LSB
Integral Nonlinearity			±0.75		LSB
Signal to Noise Ratio	DC Input		59		dBFS
Midscale Offset			±1		%FS
Gain Error			±1		%FS
Signal to Noise Ratio	Without Harmonics	53	58		dBFS
Spurious Free Dynamic Range			65		dB
Internal Reference		1.1	1.22	1.3	V
Internal Reference Voltage Drift			100		ppm/°C
Reference Voltage Input		0.8		1.5	V
Conversion Rate	Note 11			125	ksps
Supply Current ADC Operation			1		mA
Start-up Time from ADC Power Down			15		µs

Note 1. Exceeding the absolute maximum rating may damage the device.

Note 2. The device is not guaranteed to function outside its operating rating.

Note 3. Devices are ESD sensitive. Handling precautions recommended. Human body model, 1.5k in series with 100pF.

Note 4. Pin voltages are VSS or VDD.

Note 5. Higher sink/source current is possible if increased voltage changes on ports are accepted.

Note 6. Operates in the 433, 868 and 915 MHz ISM band.

Note 7. Data is Manchester-encoded before GFSK modulation.

Note 8. Optimum Load Impedance.

Note 9. Channel width and channel spacing is 200kHz.

Note 10. Channel Level +3dB over sensitivity, interfering signal a standard carrier wave, Image 2 MHz above wanted.

Note 11. Conversion rate is dependant on resolution, Please see chapter 10.3 page 32.

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Editorial Information:

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