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MSR3

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NBFM Multi-channel receiver for 868MHz SRD band

The MSR3 is a 25kHz channel narrowband receiver intended for European 868MHz band Non-Specific SRD applications. The module offers a low power, reliable data link in an industry-standard pin out and footprint.

Figure 1: MSR3-868-5 receiver

Features

- Conforms to EN 300 220-3 and EN 301 489-3
- High performance double superhet, PLL Synthesizer with TCXO
- Data rates up to 5 kbps for standard module
- Fully screened
- Feature-rich interface (RSSI, analogue and digital baseband)
- User configurable via RS232 interface
- Low power requirements

Applications

- Social alarm
- Handheld terminals
- Heavy vehicle/machine remote controls
- EPOS equipment, barcode scanners
- Data loggers
- Industrial telemetry and telecommand
- In-building environmental monitoring and control
- High-end security and fire alarms
- Vehicle data up/download

Technical Summary

- Operating frequency: 868 - 870MHz
- Custom variants on any 3MHz block from 860 to 870MHz
- Up to 32 channels
- Supply range: 4.5V - 15V
- Current consumption: 25mA receive
- Data bit rate: 5kbps max. (standard module)
- Receiver sensitivity: -118dBm (for 12 dB SINAD)
- Size: 57 x 28 x 9mm

Radiometrix Ltd, MSR3 Data Sheet   *page 1*

TBA

Figure 2: MSR3 block diagram

TBA

Figure 3: MSR3 Footprint (Top) view

Pin Description - MSR3

Pin	Name	Function
1	RSSI	DC level between 0.5v and 2.5v. 60dB dynamic range
2	0V	Ground
3	Vcc	Supply input 4.5 - 15v
4	AF out	700mV p-p audio. DC coupled, approx 1v bias
5	RXD	Open collector output of data slicer suitable for Biphase codes
6	P0/PGM	Parallel Channel select LSB Serial frequency programming / configuration[1]
7	P1	Parallel Channel select
8	P2	Parallel Channel select
9	P3	Parallel Channel select MSB

Notes:
1. There is no pullup on the open collector RXD output.
2. P0-P3 are inverted parallel frequency select inputs. They have 10K pullups to 4.4v
3. P0 requires a logic level inverted RS232 data stream when used for programming
4. A version of the LMR2 firmware is used, so most variants of the LM_series will also be possible for the MSR3
5. Two pinout versions are offered: With conventional pins, out of the bottom of the unit
   With right-angle pins, to allow 'SIL' vertical mounting
   The actual pinout and footprint follows the NRX1/2 type radio, with the addition of P0-P3

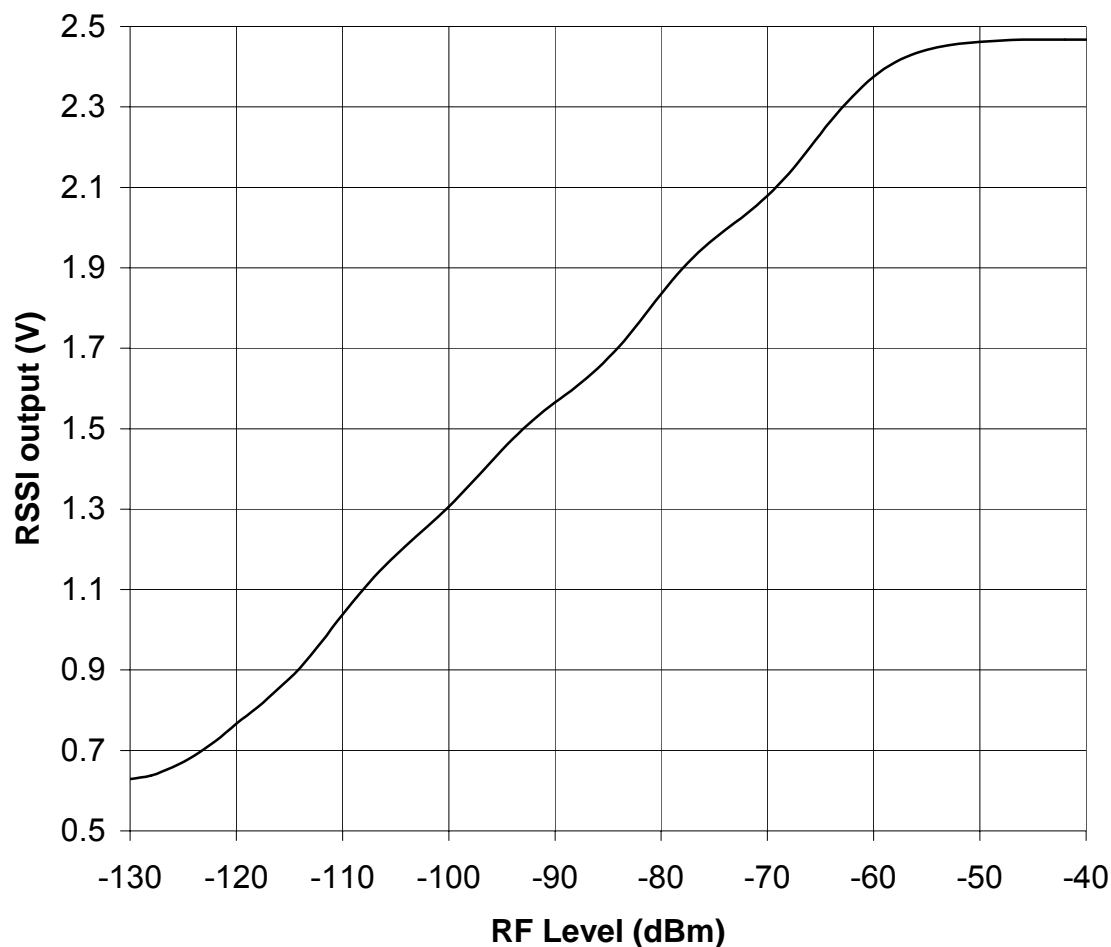**Received Signal Strength Indicator**

Figure 4: RSSI voltage variation with respect to RF level at MSR3

If the microcontroller has a built-in Analogue to Digital Converter (ADC), the Received Signal Strength Indicator (RSSI) output voltage level can be read by the microcontroller to estimate its distance from transmitting MSR3 unit or identify areas of weak signal reception.

RSSI can also be used to make a decision to switch to the second antenna in fixed installations within building where the probability of null-spots are higher.

MSR3 serial configuration commands

Serial data is sent to the unit on one of the parallel channel select pins (P0). It is very important that the unit does not 'decode' switch bounce in ordinary operation as a command string, or spurious re-writing of the e2prom will result. For this reason the user must send the 16-character string   ENABLESERIALMODE (followed by a carriage return) to fully enable the serial command mode before sending any of the command strings listed below. Command mode is disabled on power down, or on reception of a # character. You must power the unit to successfully program it.

2400 baud RS232. 8 bit data, no parity, 1 start bit, 1 or 2 stop bits, No flow control

GOCHAN aa	Serial select of channel aa (0 to 31)
LOAD aa nnnnn	Set value of N for channel aa (channels 0 to 31)
SETPAR	Channel selected by 4 bit parallel input (0 to 15)
SETSER	Channel selected by most recent 'gochan' operation
RVALUE rrrr	Enter value for R register
SINGLE nnnnn	Set value of N for single channel operation. N value NOT stored in eeprom
<cr>	Process entry
/	Clear all buffers
#	Disable command mode

aa = a two digit channel number from 00 to 31
nnnnn = synthesizer N register value, (up to 65535)
rrrr = synthesizer   R register value, (up to 16383)

$$R = \frac{f_{Xtal}}{f_{channelspacing}} = \frac{13MHz}{25kHz} \text{ , So R=520}$$

$$N = \frac{f_{RF} - IF}{f_{Channelspacing}} = \frac{868MHz - 45MHz}{25kHz} = 32920$$
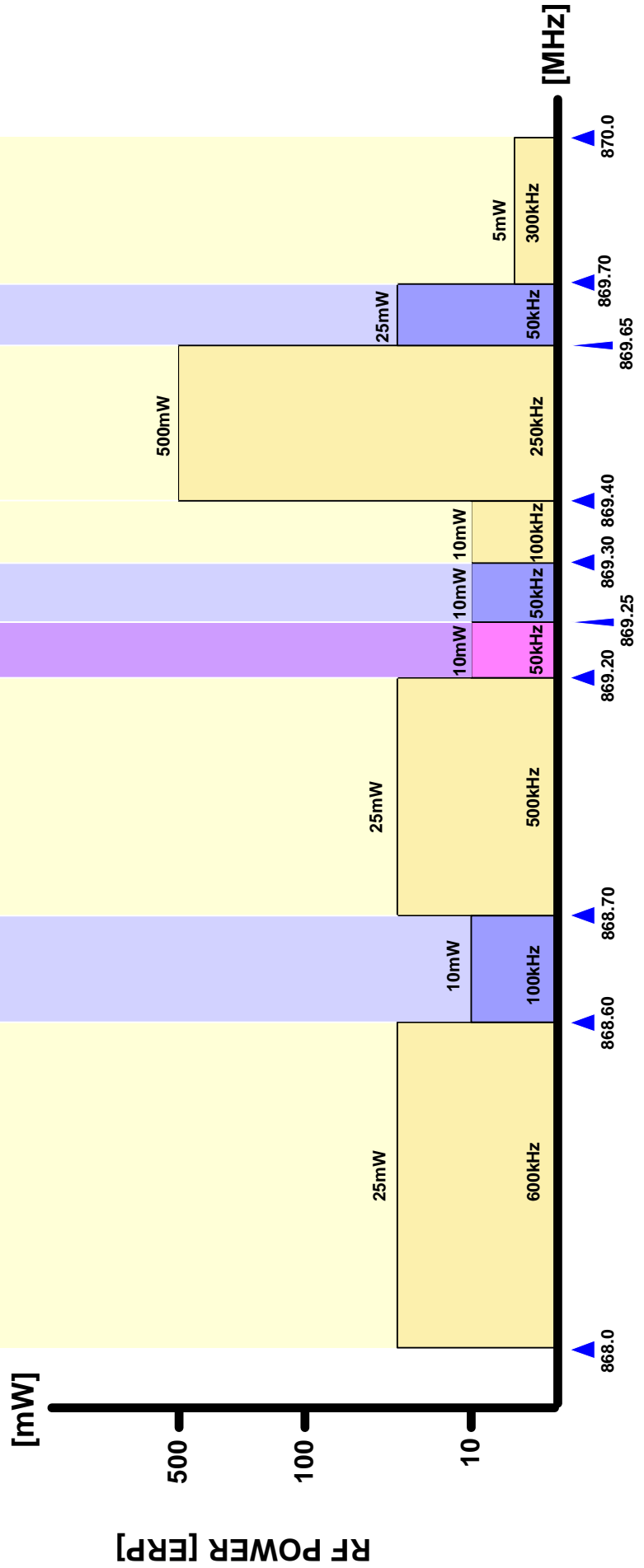
Notes:

1. When If an N value greater than 65536 is needed then an offset of +65536 can be selected by setting bit 15 of the R value high
2. A pause of at least 50ms must be allowed between command strings (EEPROM programming time) SINGLE mode does not store the N value in EEPROM. Therefore the unit is inoperative after a power down until either another valid SINGLE command is received, or mode is changed by a GOCHAN, SETPAR or SETSER command. SINGLE mode is intended for frequency agile applications.
3. /SETPAR command should be issued at the end of channel programming to put the module back into parallel frequency select mode
4. User can modify the frequency table of 32channels to any desired frequency by changing N, R values of synthesizer within $\pm1.5MHz$ of factory set Channel 0 frequency subject to the Radio Regulatory Band Allocation in the country of intended use.

Condensed specifications

Frequency	868 – 870MHz (any 3MHz band from 860 - 870MHz)
Frequency stability	+/- 1.5kHz
Channel spacing	25kHz
Number of channels	32 channels controlled via RS232 interface (16 parallel selected)
Supply *voltage*	4.5 - 15V
Current	25mA
Operating temperature	-20 to +55 ^{o}C (Storage -30 to +70 ^{o}C)
Size	57 x 28 x 9 mm
Spurious radiations	Compliant with ETSI EN 300 220-3 and EN 301 489-3
Interface	
user	9pin 0.1" pitch molex
RF	2pin 0.1" pitch molex
Recommended PCB hole size	1.2mm (min.)
Intended approval	ETSI Radio standard EN 300 220-3 and EMC standard EN 301 489-3
Receive	
Sensitivity	-118dBm for 12 dB SINAD
blocking	-90dB
adjacent channel	-65dB Tested per. ETSI 300-220 v 1.3.1
image / spurious	-60dB (or better)
Spurious radiations	Compliant with ETSI 300-220-3 and EN 301 489-3
Outputs	RSSI, carrier detect, audio, data
Power on to valid audio	28ms
Power on to stable data out (50:50 mark / space)	50ms

CEPT/ERC Rec 70-03, 868 MHz Band Plan

Applications	Non-specific SRD	Alarm	Non-specific SRD	Social Alarm	Alarm	Non-specific SRD	Alarm	Non-specific SRD
Channel Spacing	No Spacing	25kHz or WB	No Spacing	25kHz	25kHz	25kHz or Wide Band	25kHz	No Spacing
Duty Cycle	<1% or LBT	<1%	<0.1% or LBT	<0.1%	<1%	<10% or LBT	<10%	up to 100%

RF POWER [ERP]

[mW]

500

100

10

25mW — 600kHz — 868.0

10mW — 100kHz — 868.60 — 868.70

25mW — 500kHz

10mW / 10mW — 50kHz / 50kHz — 869.20 / 869.25 — 869.30

10mW / 10mW — 100kHz — 869.40

500mW — 250kHz

25mW — 50kHz — 869.65 — 869.70

5mW — 300kHz — 870.0

[MHz]

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The Intrastat commodity code for all our modules is: 8542 6000

R&TTE Directive

After 7 April 2001 the manufacturer can only place finished product on the market under the provisions of the R&TTE Directive. Equipment within the scope of the R&TTE Directive may demonstrate compliance to the essential requirements specified in Article 3 of the Directive, as appropriate to the particular equipment.
Further details are available on The Office of Communications (Ofcom) web site:

> ***http://www.ofcom.org.uk/radiocomms/ifi/***

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