Radiometrix

Hartcran House, 231 Kenton Lane, Harrow, HA3 8RP, England
Tel: +44 (0) 20 8909 9595, Fax: +44 (0) 20 8909 2233

Issue 1, 28 August 2007

SMX2

Small Multi-channel UHF Transceiver

Standard: ***SMX2-433-5 (10mW)***
Variant: ***SMX2-XXX-5 (2mW-25mW)***

SMX2 is small multi-channel UHF transceiver operating on 433.05MHz-434.79MHz European licence exempt band. SMX2 offers a fast-route to custom frequency on any UHF band from 431MHz to 436MHz with 25kHz channel spacing.

Figure 1: SMX2-433-5

Features

- Conforms to ETSI EN 300 220-3 and EN 301 489-3
- High performance double superhet, 128 channel PLL synthesizer
- Data rates up to 5 kbps for standard module
- Usable range over 500m
- Fully screened. Low profile
- Feature-rich interface (RSSI, analogue and digital baseband)
- Incorporate a 1200baud dumb modem
- Re-programmable via RS232 interface
- Low power requirements

Applications

- 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: 433.05 - 434.79MHz
- Custom variants from 431 - 436MHz on any 1MHz band
- 128 channels controlled via RS232 interface
- Transmit power: +10dBm (10mW) nominal. Adjustable 2 – 25mW
- Supply range: 4.2V - 15V
- Current consumption: 30mA (10mW) transmit, 25mA receive
- Data bit rate: 5kbps max. (standard module)
- Receiver sensitivity: -120dBm (for 12 dB SINAD)
- Size: 53 x 32 x 12mm

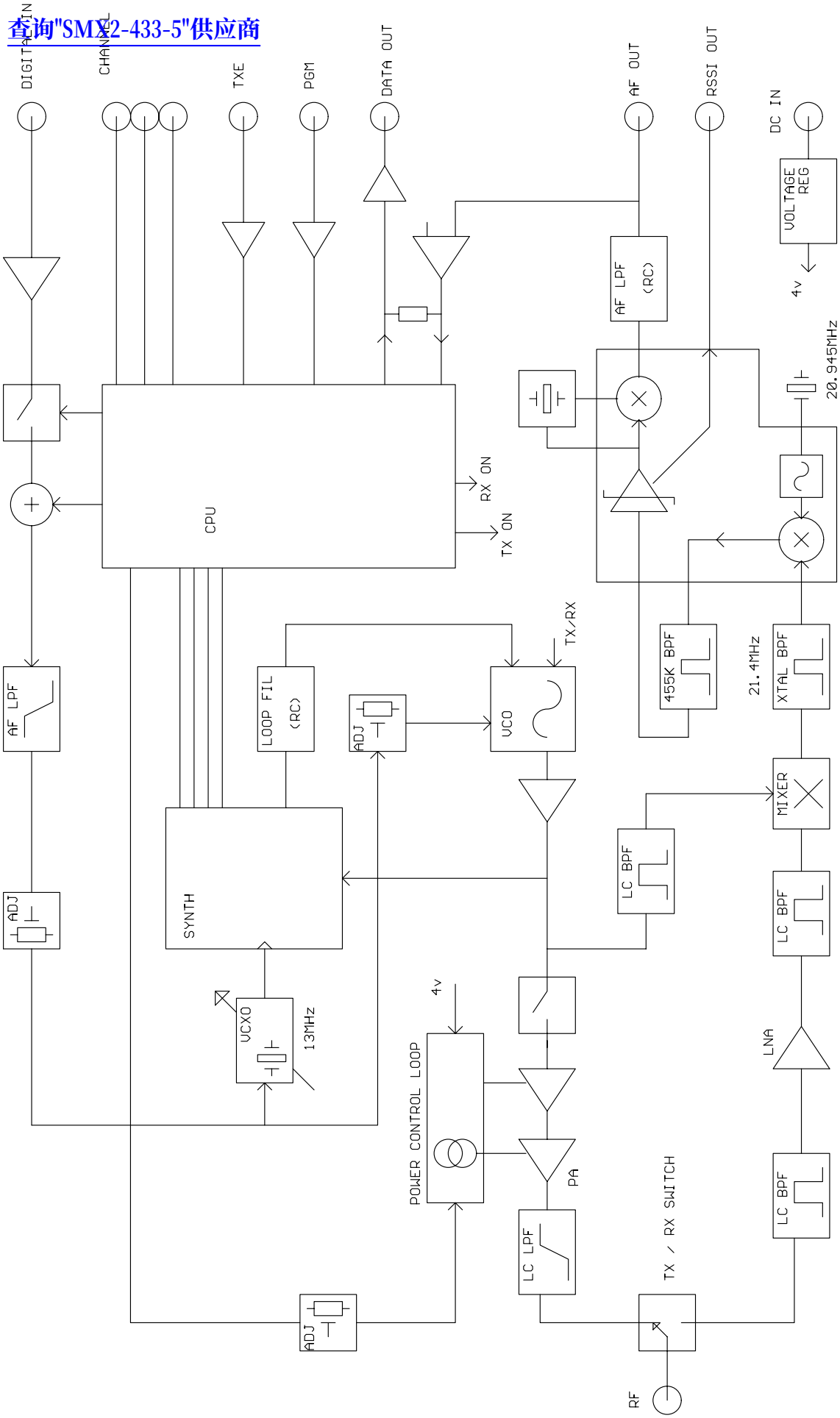

Figure 2: SMX2 block diagram

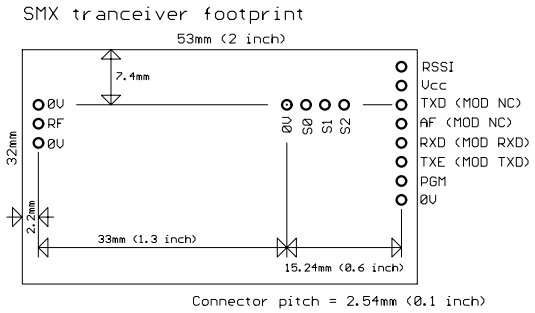

Figure 3: SMX2 footprint (Top) view

Pin Description

Pin	Name	Function
1a	RSSI	DC level between 0.5V and 2.5V. 60dB dynamic range
2a	Vcc	DC supply input. (4.2 – 15V at 50mA max.)
3a	TXD	DC coupled input for TTL/ CMOS logic.
4a	AF out	500mV p-p audio. DC coupled, approx 0.8V bias.
5a	RXD	Open collector output of data slicer. Need external pull-up
6a	TXE	Transmit enable. Low = RX mode. High = TX. (10kΩ pull down)
7a	PGM	Serial programming / control input (true RS232)
8a	0V	Ground
1b	0V	Ground
2b	S0	Parallel channel select LSB
3b	S1	Parallel channel select
4b	S2	Parallel channel select MSB

Pin description of SMX2 with Modem mode selected

The 'modem' mentioned is a 1200 baud RS232 semi-intelligent unit (Transmit keyed when valid serial data is present, so no separate TX control needed. Coding in the datastream also permits the receiver to ignore noise and only output valid serial data) This is a half duplex unit, so collisions between transmitted and received packets must be dealt with by the user (if transmit data is sent to the unit then a transmit burst commences immediately and the contents of the receive data buffer is lost)

Pin	Name	Function
1a	RSSI	DC level between 0.5V and 2.5V. 60dB dynamic range
2a	Vcc	DC supply input. (4.2 – 15V at 50mA max.)
3a	NC	Leave unconnected
4a	NC	Leave unconnected
5a	MOD RXD	Open collector RS232 compatible data output
6a	MOD TXD	RS232 data input
7a	PGM	Serial programming/control input (true RS232)
8a	0V	Ground
1b	0V	Ground
2b	S0	Parallel channel select LSB
3b	S1	Parallel channel select
4b	S2	Parallel channel select MSB

NOTES:

1. No inversion occurs between TXD and RXD. However AF out *is* inverted relative to TXD.
2. Parallel channel selects are active LOW and have internal pullups to 4V
3. There are no pullups on the open collector outputs.
4. The software incorporates a 1200 baud modem, compatible with that implemented in other Radiometrix narrowband units (i1200 tones and format). Modem operation is selected by the SETMOD command. TXE pin (6a) becomes an RS232 input, and RS232 compatible data is output on the RXD pin (5a). If true +/- levels are desired then an inverter and a MAX232 should be used on data out.

5. RS232 input pins (6a and 7a) tolerate true +/- levels. No buffering is required.
6. If 9600 baud data modulation is needed, then connect a series 1µF cap + 500kΩ trimmer in the baseband in circuit. Adjust trimmer for 90% of peak deviation (+/- 2.7KHz) at mean input level.
7. If parallel channel select is not wanted, the 4 pin connector 'b' can be removed

SMX2 serial interface commands

2400 baud at RS232 level. 8 bit data, no parity, 1 start bit, 1 or 2 stop bits, No flow control.
Transmit (pin 3 on DB9) and Signal Ground (pin 5 on DB9) should be connected to PGM and 0V respectively.

SINGLE nnnnn	Set value of N for single channel operation (value not stored in eeprom)
GOCHAN xx	Serial select of channel xx (0 to 127)
LOADMX xx	Set highest permitted (serial selected) channel xx (others default to ch0)
LOAD aa nnnnn	Set value of N for channel aa (channels 0 to 15)
LOADTB nnnnn	Set value of N for channel 16 (channels 17 to 127 then in sequence)
RVALUE rrrr	Enter value for R register
SETPAR	Channel selected by 3 bit parallel input (0 to 7). Also disables modem
SETSER	Channel selected by most recent 'gochan' operation
SETMOD	Enable internal modem. Frequency selected by most recent 'gochan' or 'single'
<cr>	Process entry
/	Clear all buffers

xx = channel number from 00 to 127
aa = two digit channel number from 00 to 15
nnnnn = synthesizer N register value, (up to 65535)
rrrr = synthesizer R register value, (up to 16383)

$$N = \frac{f_{RF}}{f_{Channelspacing}} = \frac{433.05MHz}{25kHz} = 17322 \qquad R = \frac{f_{Xtal}}{f_{channelspacing}} = \frac{13MHz}{25kHz}, \text{ So R=520}$$

Notes:

1. *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.
2. */SETPAR command should be issued at the end of channel programming to put the module back into parallel frequency select mode*

Condensed specifications

Frequency	433.05 - 434.79MHz (Any 1MHz band from 431 - 436MHz)
Frequency stability	±2kHz
Channel spacing	25kHz (12.5kHz by special order)
Number of channels	128 channels selected via serial RS232 interface 8 channels parallel selected (via 3 frequency select pins)
	in 433MHz band only 69 channels are used as standard
Supply *voltage*	4.2V-15V
Current	30mA @ 10mW transmit [25mW version @ 45mA]
	25mA receive (or modem 'idle')
Operating temperature	-10 to +60 C (Storage -30 to +70 C)
Size	53 x 32 x 12 mm
Spurious radiations	Compliant with ETSI EN 300 220-3 and EN 301 489-3
Interface	
user	8 pin 0.1" pitch molex
Power	4 pin 0.1" pitch molex
RF	3 pin 0.1" pitch molex
Recommended PCB hole size	1.2mm (min.)
Transmitter	
Output power	+10dBm(10mW) ± 1dB (factory adjustable: 2 - 25mW)
TX on switching time	<50 ms
Modulation type	FM, FSK (F1D, F3D)
TX modulation bandwidth	DC – 3kHz
Deviation	±3kHz
Adjacent channel TX power	-37dBm
TX spurii	<-45dBm
Inputs	Data (CMOS/TTL compatible)
Receiver	
Sensitivity	-120dBm for 12dB SINAD
	-112dBm for 1 part per 1000 BER
image / spurious	-60dB
blocking	-85dB
adjacent channel	-60dB (Tested per. ETSI EN 301 489-3)
Outputs	RSSI, Audio, Data
Power on to valid audio	28ms
Power on to stable data out	50ms (for 50:50 mark / space)

Notes: 1. The data slicer cannot be depended upon for data waveform frequencies below 250Hz

2. When RX is on and a transmitter keys up, again a 50ms period is required to stabilise data output mark/space. i.e. allow at least 50ms of preamble

Application circuits

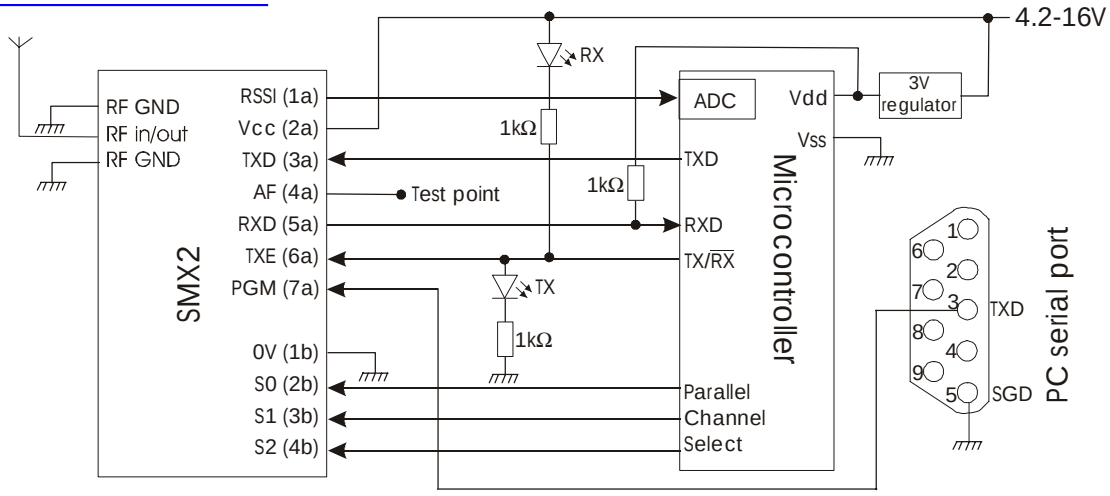

Figure 4: SMX2 interfaced to host microcontroller and serial port for configuration

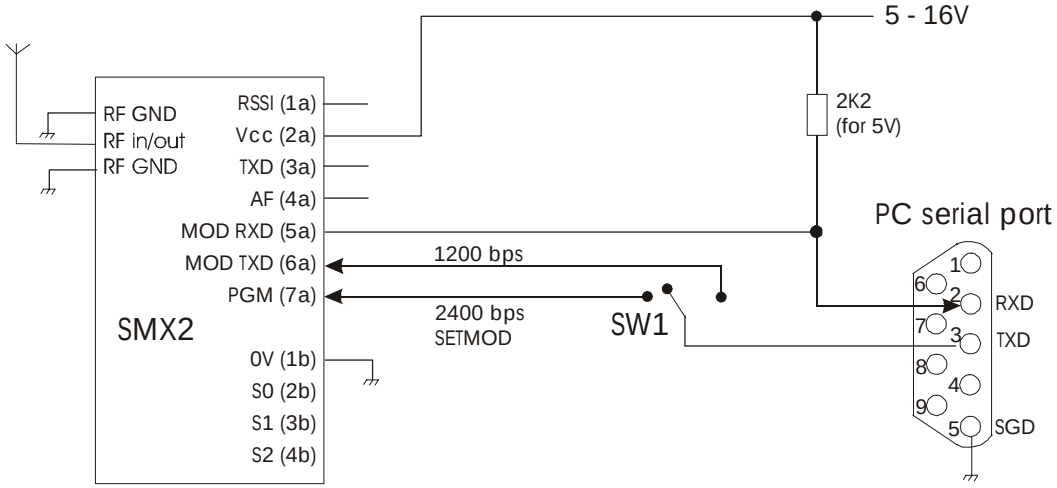

Figure 5: SMX2 interfaced to PC serial port (0V / 5V RS232 level)

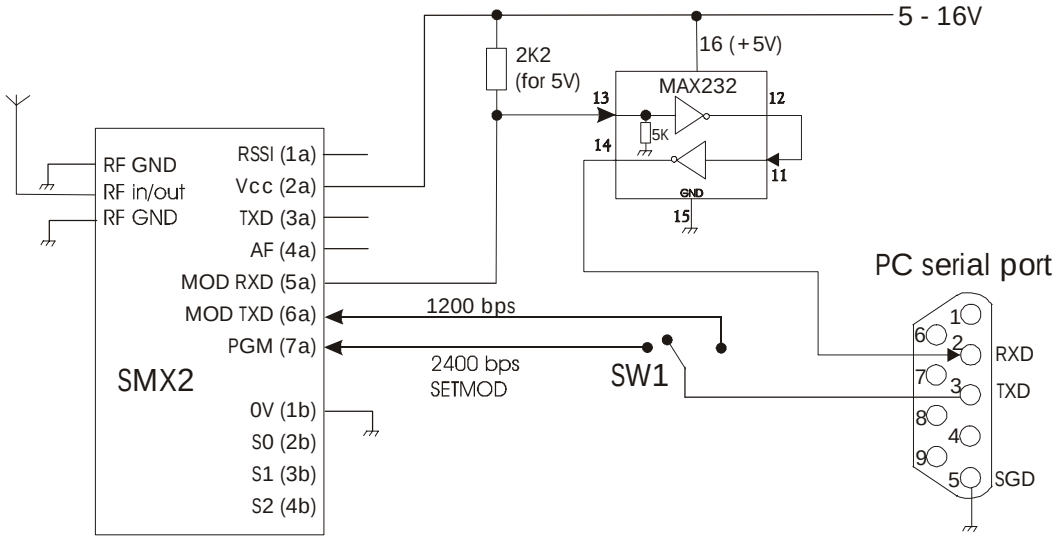

Figure 6: SMX2 interfaced to serial port (+10V / -10V RS232 level)

Radiometrix Ltd

Hartcran House
231 Kenton Lane
Harrow, Middlesex
HA3 8RP
ENGLAND
Tel: +44 (0) 20 8909 9595
Fax: +44 (0) 20 8909 2233
sales@radiometrix.com
www.radiometrix.com

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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/

Information Requests
Ofcom
Riverside House
2a Southwark Bridge Road
London SE1 9HA
Tel: +44 (0)845 456 3000 or 020 7981 3040
Fax: +44 (0)20 7783 4033
information.requests@ofcom.org.uk

European Radiocommunications Office (ERO)
Peblingehus
Nansensgade 19
DK 1366 Copenhagen
Tel. +45 33896300
Fax +45 33896330
ero@ero.dk
www.ero.dk