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CLX2

PRELIMINARY

Issue A, 10 April 2012

19200 baud modem transceiver

The CLX2s a 19,200baud half-duplex serial radio modem module operating on licence-exempt European 433.05-434.79MHz SRD band. CLX2 is an intermediate level OEM radio modem which is in between a raw FSK radio module like BiM2G and a sophisticated OEM radio modem like RPM2A. It takes care of preamble, frame synchronisation and error checking.

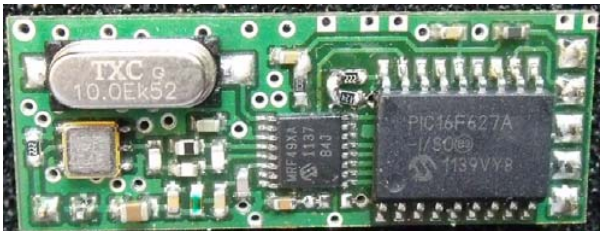

Figure 1: CLX2-433-19

Features

- Conforms to EN 300 220-2 and EN 301 489-3
- SAW front-end filter
- Small size
- Low cost
- Direct interface to microcontroller UART
- Serial modem baud rate at 19,200bps (half-duplex)

Applications

- Home/Industrial Automation
- Vehicle Sensor Monitoring
- Telemetry
- Data Logging Systems
- Security Systems for Home/Industrial
- In-building environmental monitoring and control
- Sports and Performance Monitoring

Technical Summary

- Operating frequency: 433.92MHz (default)
- Modulation: 34.5kbps NRZ FSK
- UART interface: 19,200bps, 8 data bits, None Parity, None Flow Control
- Supply: 3.3V at 23mA transmit, 13mA receive and <2mA standby
- Transmit power: +3dBm (2mW)
- Receiver sensitivity: -95dBm (for 1% BER)
- 32 byte data buffer
- 40 x 14 x 5mm

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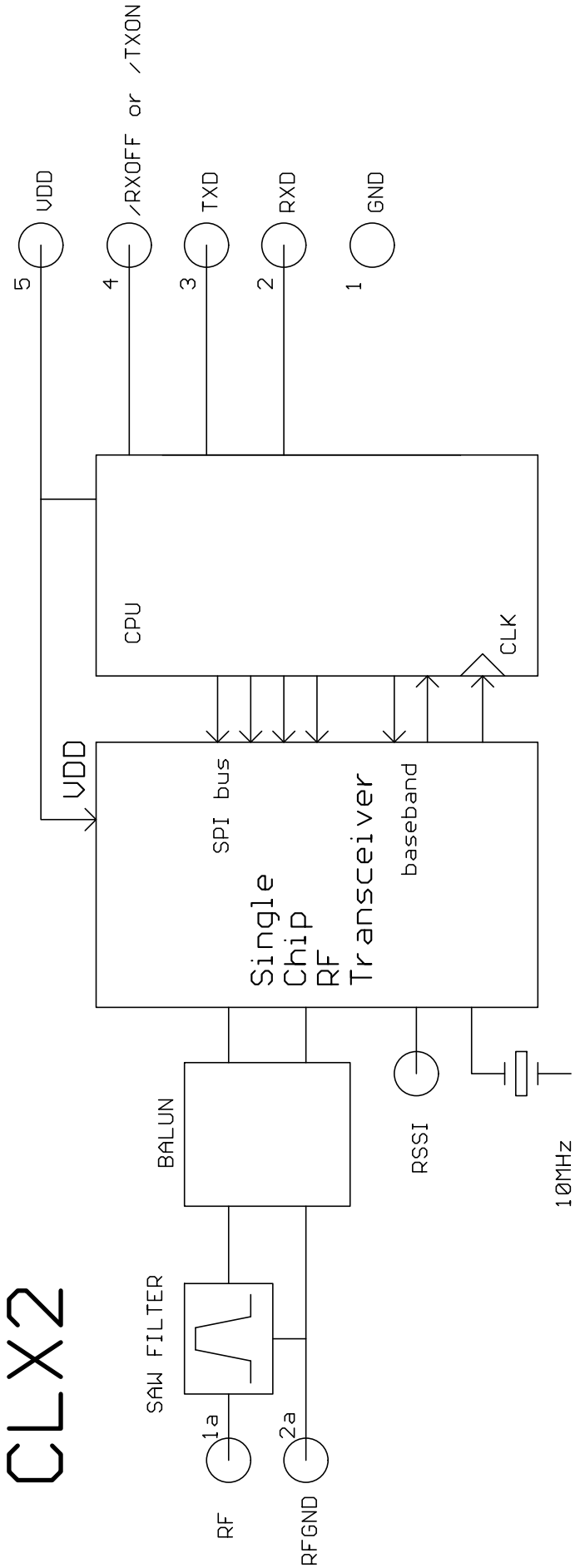

Figure 2: CLX2 block diagram

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The radio / datastream interface

A 32 byte software FIFO is implemented in both the transmit and receive code. At the transmit end this is used to allow for the transmitter start up time (about 4ms), while on receive it buffers arriving packets to the constant output data rate. All timing and data formatting tasks are handled by the software. The user need not worry about keying the transmitter before sending data: the link is entirely transparent.

For transmission across the radio link data is formatted into packets, each comprising 6 bytes of data, a preamble sequence, a sync code and a checksum. If less than 6 bytes are in the transmit end FIFO then a packet is still sent, but idle codes replaces the unused bytes. When the transmit end FIFO is completely emptied, then the transmitter is keyed off .

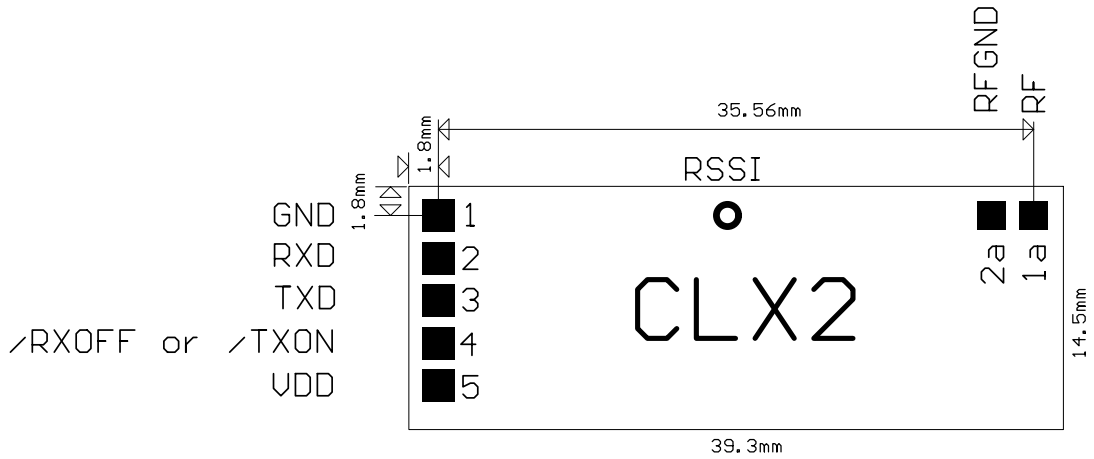

Figure 3: CLX2 footprint (top view)

Pin description

Pin	Name	Function
1	GND	Ground
2	RXD	Received Data output at 3V UART (inverted RS232) level
3	TXD	Transmit Data input at 3V UART (inverted RS232) level [No pull-up]
4	/TXON /RXOFF	/TXON Active low Transmitter ON indicator Output [Transmit Mode] /RXOFF Active low Receiver hot Standby Input [Receive Mode] Open drain, 50kΩ internal pull-up
5	VDD	3.3V DC (externally regulated power supply)
	RSSI	Received Signal Strength Indicator output (An optional pad for wire connection)
1a	RF	RF in/out (50Ω impedance)
2a	RFGND	RF Ground

Notes:

1. TXD has no internal pull-up. If the unit is used in Receive only mode, tie this pin to VCC
2. VDD must be a clean 3.3V DC regulated supply
3. The STATUS pin. In transmit, this pin pulls low if the device is transmitting a data packet. On receive it floats high. If pulled low in receive, the unit goes into hot standby (<2mA) In standby the unit does not receive, but will go into transmit if valid data is presented to TXD.
4. TXD / RXD are inverted RS232 at 3V CMOS levels. To connect to a true RS232 device, inverting level shifters must be used (e.g. MAX232 type are ideal, but simple NPN transistor switches with pull-ups often suffice). With typical microcontrollers and UARTs, direct connection is possible.
5. The CLX2 provides a half duplex link, but provided no two devices attempt to transmit at one time then no further restrictions on data transmission need be made, as all transmit timing, valid data identification and datastream buffering is conducted by the unit. There is no 'transmit enable' pin. Synchronisation and framing words in the packet prevent the receiver outputting garbage in the absence of signal or presence of interference.
6. A 2.2kΩ resistance is present from RF pin 1a to ground for ESD protection

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Condensed specifications

Frequency	433.92MHz
Frequency stability	±10kHz
Channel width	400kHz
Number of channels	1
Supply *Voltage*	3.3V DC
Current	23mA transmit
	13mA receive/ <2mA standby
Operating temperature	-20°C to +55°C (Storage -30°C to +70°C)
Spurious radiations	Compliant with ETSI EN 300 220-2 and EN 301 489-3
Interfaces	
User	5pin 0.1" pitch molex (pin 6 absent)
RF	2pin 0.1" pitch molex
Size	40 x 14 x 5mm
Transmitter	
Output power	2mW ±1dB
TX on switching time	<4ms
Modulation type	35kbps NRZ FSK
FM peak deviation	+/-90KHz (nominal)
TX spurious	<-36dBm
Receiver	
Sensitivity	-95dBm (for 0.1% data error)
Blocking	-50dB (±1MHz)
Local Oscillator re-radiation	<-57dBm
Interface	
Data rate	19,200baud, Half duplex
Format	1 Start bit, 8 Data bits, No parity, 1 Stop bit
Levels	3V CMOS (inverted RS232 '0'=0V, '1'=3V)
Buffers	32 byte FIFO
Flow control	None
Initial start up	10ms from power on

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Antenna requirements

Three types of integral antenna are recommended and approved for use with the module:

A) ***Whip*** This is a wire, rod ,PCB track or combination connected directly to RF pin of the module. Optimum total length is 16cm (1/4 wave @ 433MHz). Keep the open circuit (hot) end well away from metal components to prevent serious de-tuning. Whips are ground plane sensitive and will benefit from internal 1/4 wave earthed radial(s) if the product is small and plastic cased

B) ***Helical*** Wire coil, connected directly to RF pin, open circuit at other end. This antenna is very efficient given it's small size (20mm x 4mm dia.). The helical is a high Q antenna, trim the wire length or expand the coil for optimum results. The helical de-tunes badly with proximity to other conductive objects.

C) ***Loop*** A loop of PCB track tuned by a fixed or variable capacitor to ground at the 'hot' end and fed from RF pin at a point 20% from the ground end. Loops have high immunity to proximity de-tuning.

	A	B	C
	whip	***helical***	***loop***
Ultimate performance	***	**	*
Easy of design set-up	***	**	*
Size	*	***	**
Immunity proximity effects	*	**	***

The antenna choice and position directly controls the system range. Keep it clear of other metal in the system, particularly the 'hot' end. The best position by far, is sticking out the top of the product. This is often not desirable for practical/ergonomic reasons thus a compromise may need to be reached. If an internal antenna must be used, try to keep it away from other metal components, particularly large ones like transformers, batteries and PCB tracks/earth plane. The space around the antenna is as important as the antenna itself.

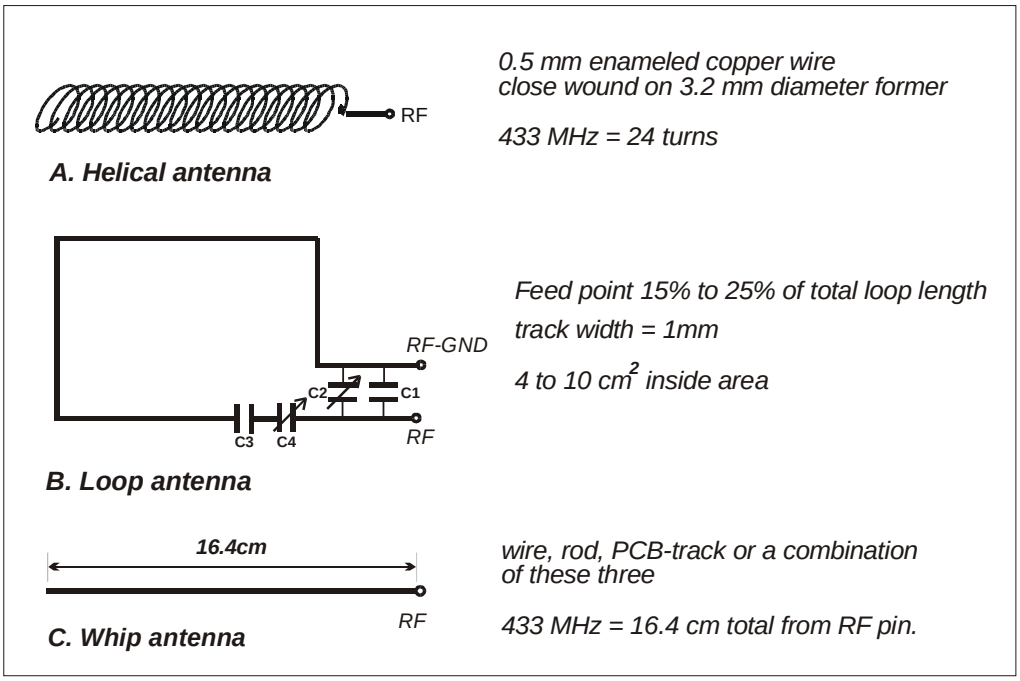

Figure 4: Antenna types

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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.erodocdb.dk/Docs/doc98/official/pdf/REC7003e.pdf

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