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RDL2

Issue 1, 31 July 2012

UHF Multi Channel Wide Band FM Transceiver

RDL2 is a half-duplex multi channel wideband FM transceiver in a BiM series footprint and operates on 433.05-434.79MHz European SRD band.

This makes the RDL2 ideally suited to those low power applications where low cost multi-channel operation is required.

Figure 1: RDL2-433-32

The RDL2 is a half duplex radio transceiver module for use in high-speed bi-directional data transfer applications at ranges up to 300metres. The small footprint of 23 x 33mm together with low power requirements of <28mA @ 5V enable convenient PCB installation.

RDL2 allows operation on one of 5 pre-set frequencies in the 433MHz European licence exempt frequency band. These frequencies are non-overlapping and simultaneous operation of RDL2s in the same area on different channels will be possible. Units are supplied on 433.92MHz (Ch0) as default.

Features

- Conforms to European EN 301 489-3 and ETSI EN 300 220-3
- Data rates up to 32kbps
- High performance double superhet, PLL synthesizer
- Usable range up to 300 metres external, 75 metres in building
- SAW front end filter and full screening
- Low profile with small footprint
- 5 serial select wideband channels
- Available as RDL2T transmitter and RDL2R receiver for one-way communication

Applications

- PDAs, organisers & laptops
- Handheld / portable terminals
- EPOS equipment, barcode scanners
- In-building environmental monitoring and control
- Remote data acquisition system, data logging
- Fleet management, vehicle data acquisition

Technical Summary

- Operating frequency: 433.92MHz (default)
- Supply: regulated 5V @ 28mA TX, 24mA Rx
- Transmit power: +10dBm (10mW)
- Receiver sensitivity: -115dBm for 12dB SINAD
- Adjacent channel rejection: 65db @ ±320kHz
- Receiver Blocking: 80dB min.
- Size: 33 x 23 x 7mm

Evaluation platforms: UNI-EVAL (RDL special)

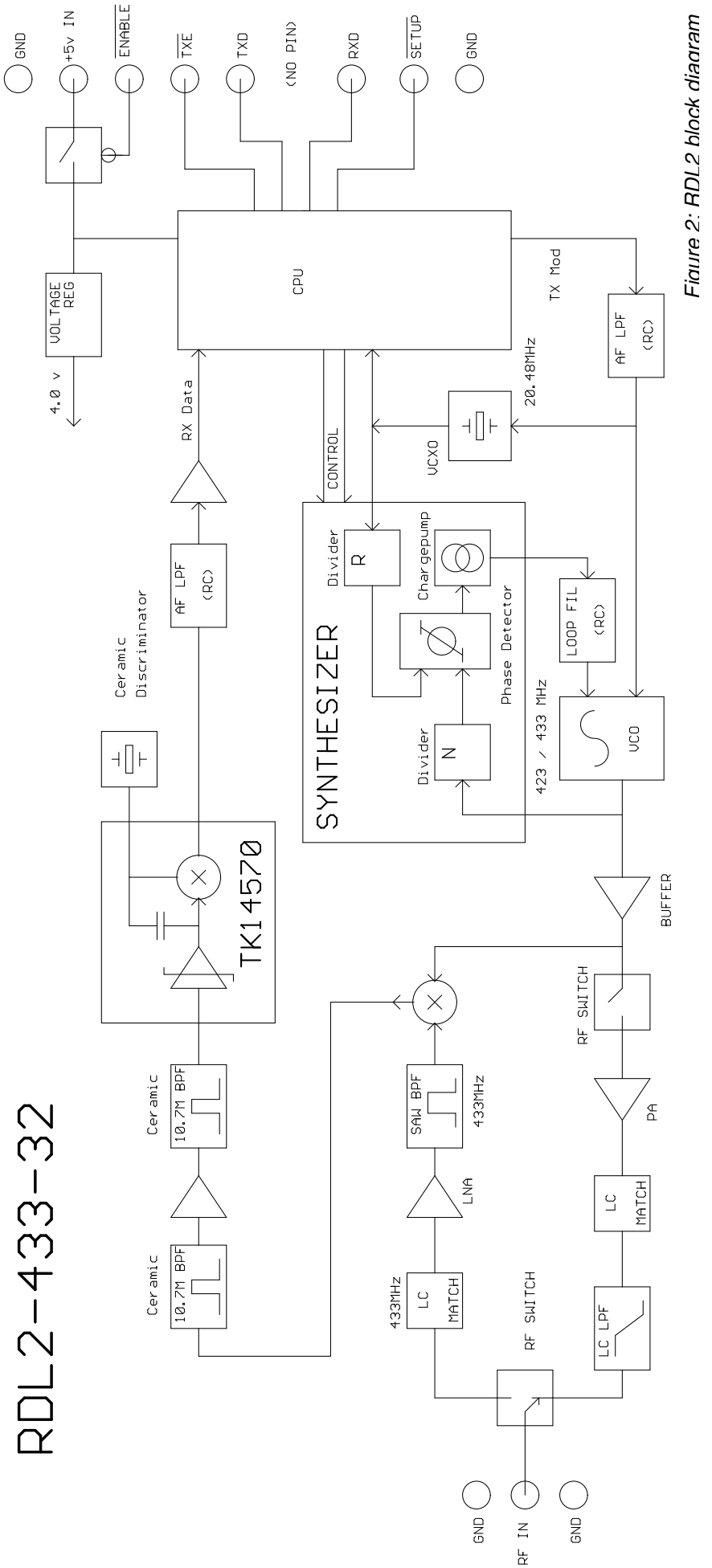

Figure 2: RDL2 block diagram

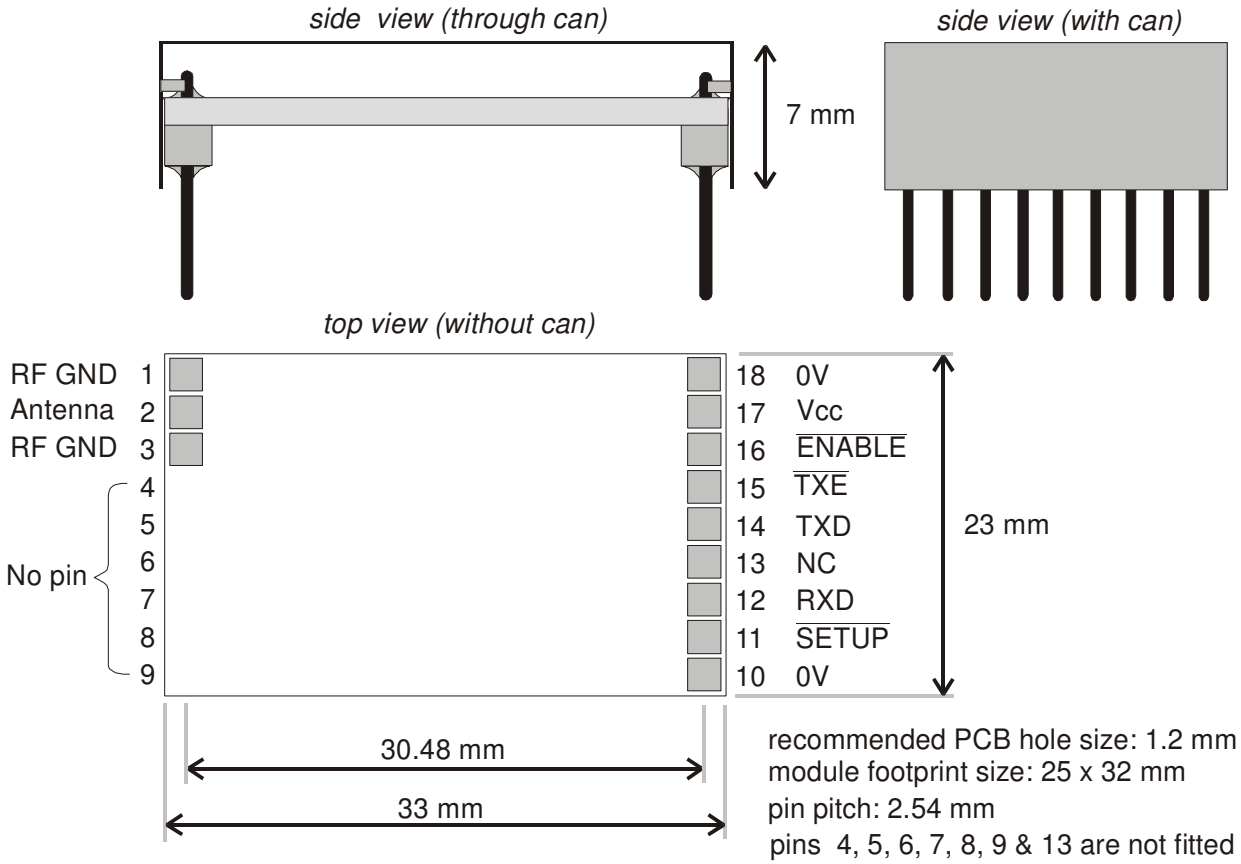

Figure 3: RDL2 footprint (top view)

Pin description

Pin	Name	Function
18	0V	Ground
17	Vcc	5V regulated power supply (4.75 - 5.25v)
16	$\overline{\text{ENABLE}}$	Pull low to enable module
15	$\overline{\text{TXE}}$	Pull low to transmit
14	TXD	Transmit Data input (5v CMOS logic. No pullup)
13	NC	No Pin
12	RXD	Receive Data output (5v CMOS logic output)
11	$\overline{\text{SETUP}}$	Pull low to enter test/setup mode (5v CMOS logic. Pullup present sometimes)
10	0V	Ground

Notes:
1. Pinout is similar to a BiM2A. On RF connector end only pins 1,2,3 are present.
2. TXD / RXD are a direct connection to the radio hardware's baseband signals

RF GND *pin 1 & 3*
RF Ground pin, internally connected to the module screen and pin 8, 9, 10 and 18 (0V). This pin should be connected to the RF return path (e.g. co-axial cable braid, main PCB ground plane, etc).

RF *pin 2*
50Ω RF input/output from the antenna, it is DC isolated internally. (see antenna section for details).

GND *pin 8, 9, 10 and 18*
Supply ground connection to ground plane and can.

VCC *pin 17*
5V voltage regulator should be used to have a clean 5V supply to the module. A 4V regulator is used inside for radio circuitry.

$\overline{\text{ENABLE}}$ *pin 16*
Active low enable pin. It has a 10kΩ pull-up to Vcc. It should be pulled Low to enable the module.

$\overline{\text{TXE}}$ *pin 15*
Active low enables transmitter. It has a 10kΩ pull-up to Vcc. (if used in RX only, tie this pin to +5v)

TXD *pin 14*
This is a 5V CMOS logic level input. It can be directly interfaced to data output of a UART in a microcontroller. TXD does not have an internal pull-up.

NC *pin 13*
There is no pin in this position.

RXD *pin 12*
This is a 5V CMOS logic level output. It can be directly interfaced to data input of a UART in a microcontroller.

$\overline{\text{SETUP}}$ *pin 11*
Pull low to enter test/setup mode. This is only sampled at power-up, and on tx>rx or rx>tx transitions. The pullup only enables at these times.

Programming the RDL2

As supplied, the RDL2 is set to default channel zero. To change this preset, it is necessary to enter setup/program mode.

The RDL2 is programmed through the same TXD / RXD pins that is used for sending/receiving data. An RS232 terminal emulator (such as Aterm or HyperTerminal) is an ideal tool.

To connect to a true RS232 device, inverting RS232-CMOS level shifters must be used. Maxim MAX232 or equivalent are ideal, but simple NPN transistor switches with pull-ups often suffice. With typical microcontrollers and UARTs, direct connection is possible.

To enter program mode the SETUP pin (pin 11) must be held low at turn-on, or during a change of TXE pin state. In this mode the radio link is disabled, but the TXD / RXD pins become a 9600 baud programming interface. (Bytes received are echoed back on the RXD pin).

In 'setup' the unit will only respond to certain command strings:

CHAN0 to **CHAN4** <CR>: These commands select one of 5 preset channels

A RDL2 will only communicate with a unit set to the same channel.

Channel number is stored in volatile memory. On power-up the RDL2 reverts to the default in EEPROM (as supplied this is always Channel 0)

SETPROGRAM <CR>: Writes the current address and current channel into EEPROM as the new default.
A tilda character (~, ascii 126dec) sent by the unit indicates end of EEPROM write sequence

(these commands are normally only used for factory diagnostics)
NOTONE <CR>: Transmit unmodulated carrier
LFTONE <CR>: Transmit carrier modulated with 8KHz squarewave
HFTONE <CR>: Transmit carrier modulated with 16KHz squarewave
<CR>: Transmitter off

A Carriage Return '<CR>' (00Dhex) should be entered after each command sequence to execute it.

Releasing the SETUP pin to high state returns the RDL2 to normal operation.

Condensed specifications

Frequency	433.92MHz – CHAN0 (default channel)
	433.28MHz – CHAN1
	433.60MHz – CHAN2
	434.24MHz – CHAN3
	434.56MHz – CHAN4
Frequency stability	±10kHz
Channel width	320kHz
Number of channels	1 of 5, user programmed
Transmitter	
Output power	10dBm (10mW) ±1dB
TX on switching time	<5ms
Modulation type	FSK
FM peak deviation	+/-25KHz
TX spurious	<-45dBm
Receiver	
Sensitivity	-115dBm for 12dB SINAD, 1KHz tone, at the analogue AF test
image	-40dB
spurious / adjacent channel	-60dB
Blocking	-80dB min
LO re-radiation	<-60dBm
Interface	
Data rate	DC – 32kbps (NRZ)
Levels	5V CMOS
Supply *Voltage*	5V
Current	28mA transmit
	24mA receive / idle
Interfaces	
User	9pin 0.1" pitch molex (pin 6 absent)
RF	3pin 0.1" pitch molex
Size	33 x 23 x 7mm
Operating temperature	-20 °C to +70 °C (Storage -30 °C to +70 °C)
Spurious radiations	Compliant with ETSI EN 300 220-3 and EN 301 489-3

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.

Feature	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.

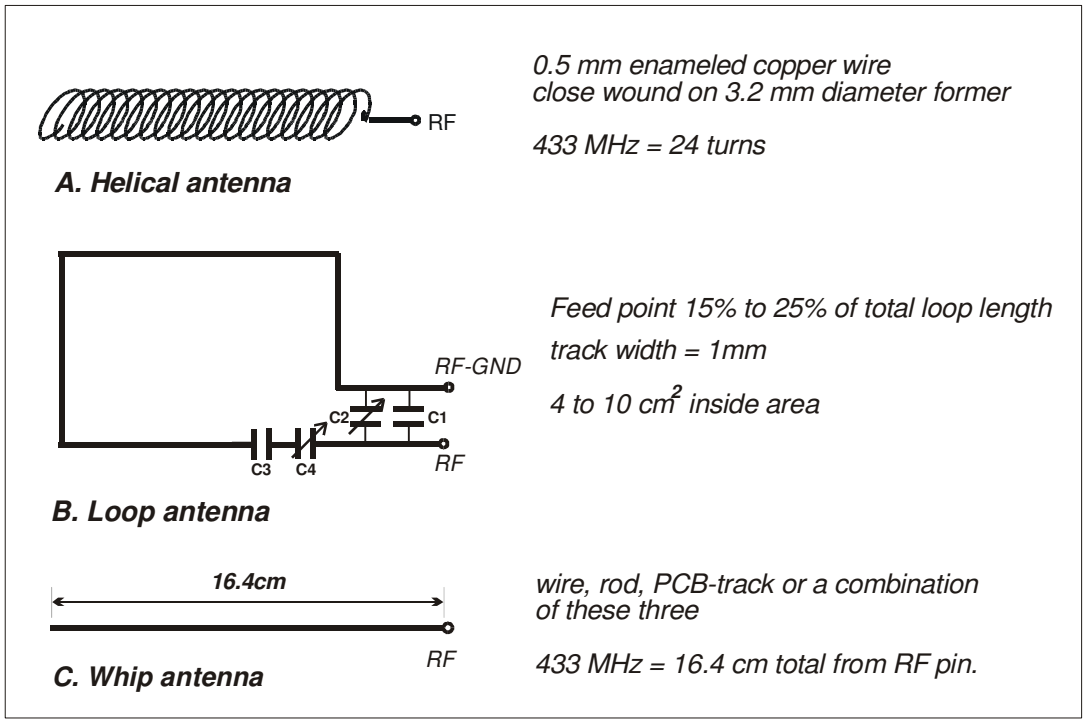

Figure 4: Antenna types

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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.ofcom.org.uk/

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