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

TR2R-458-10 Issue 1, 26 November 2025

UHF Narrow Band FM multi channel radio Receiver

The TR2R receiver modules offer a low power, reliable data link in an industry-standard pin out and footprint. This makes the TR2R ideally suited to those low power applications where existing wideband modules have insufficient range, or where multi-channel operation is needed. covering the 458.5 - 459.1MHz UK band and the European 433.05-434.79MHz band.

Figure 1: TR2R-458-10

Features

- Conforms to ETSI EN 300 220-2, EN 301 489-3
- Any custom band between 420MHz and 475MHz with 5MHz switching bandwidth
- High performance double superhet, 128 channel PLL synthesizer with TCXO
- Data rates up to 5kbps for standard module
- Usable range over 1km
- Fully screened. Low profile
- Feature-rich interface (RSSI, automatic noise squelch, analogue and digital baseband)
- Incorporate a 1200baud dumb modem
- Re-programmable via RS232 interface
- Low power requirements
- Compliant with European RoHS Directive 2011/65/EU

Applications

- Handheld terminals
- Medical telemetry
- Data loggers
- Industrial telemetry and telecommand
- In-building environmental monitoring and control
- High-end security and fire alarms
- Vehicle data up/download

Technical Summary

- Size: 59 x 38 x 10mm
- Operating frequency: 458.5-459.1MHz or 433.05-434.79MHz
- Supply range: 4.5V - 16V DC
- Current consumption: 27mA receive
- Data bit rate: 10kbps max.
- Receiver sensitivity: -118dBm (for 12 dB SINAD)

Evaluation platforms: NBEK + xx2M carrier

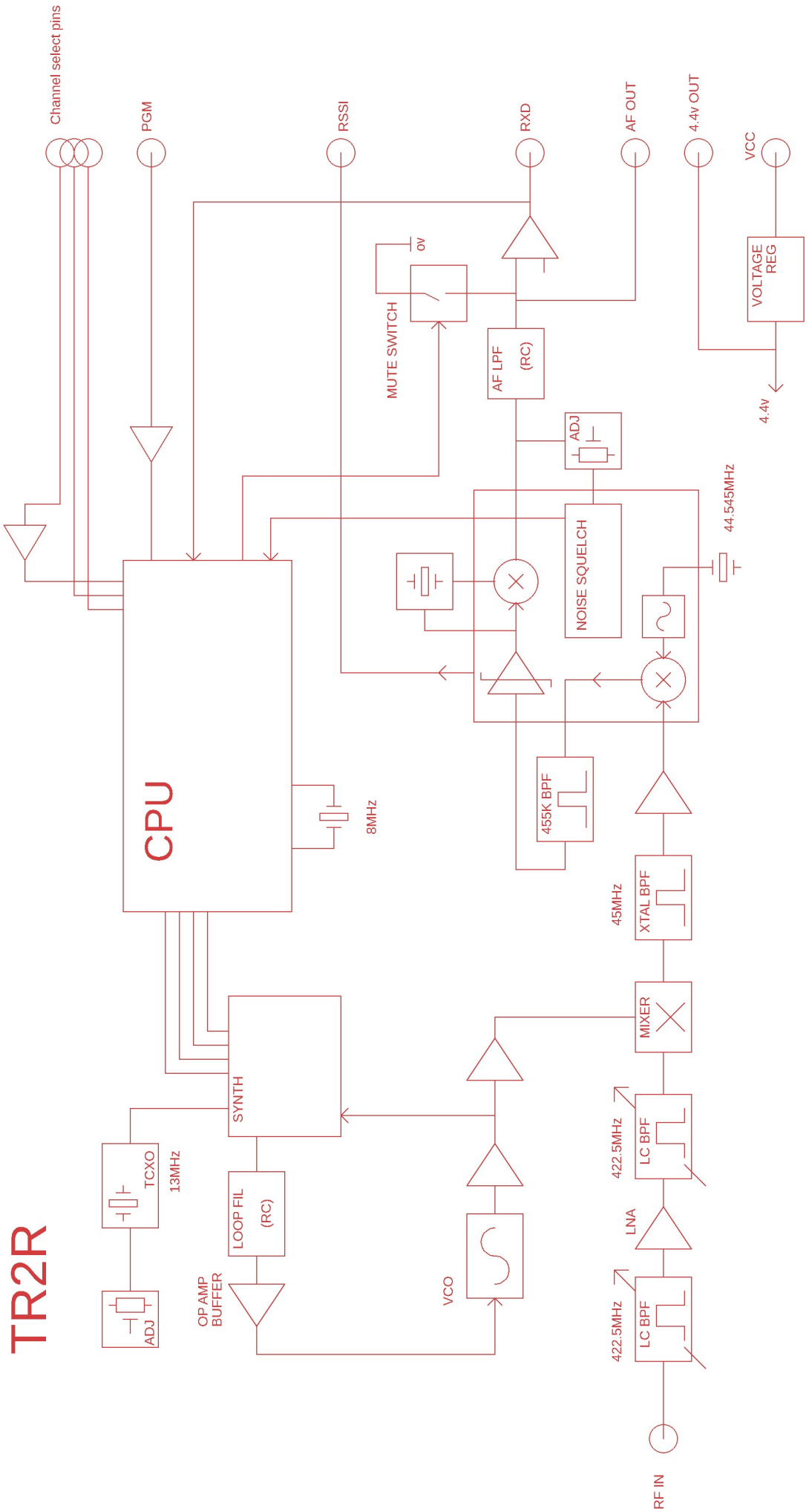

Figure 2: TR2R block diagram

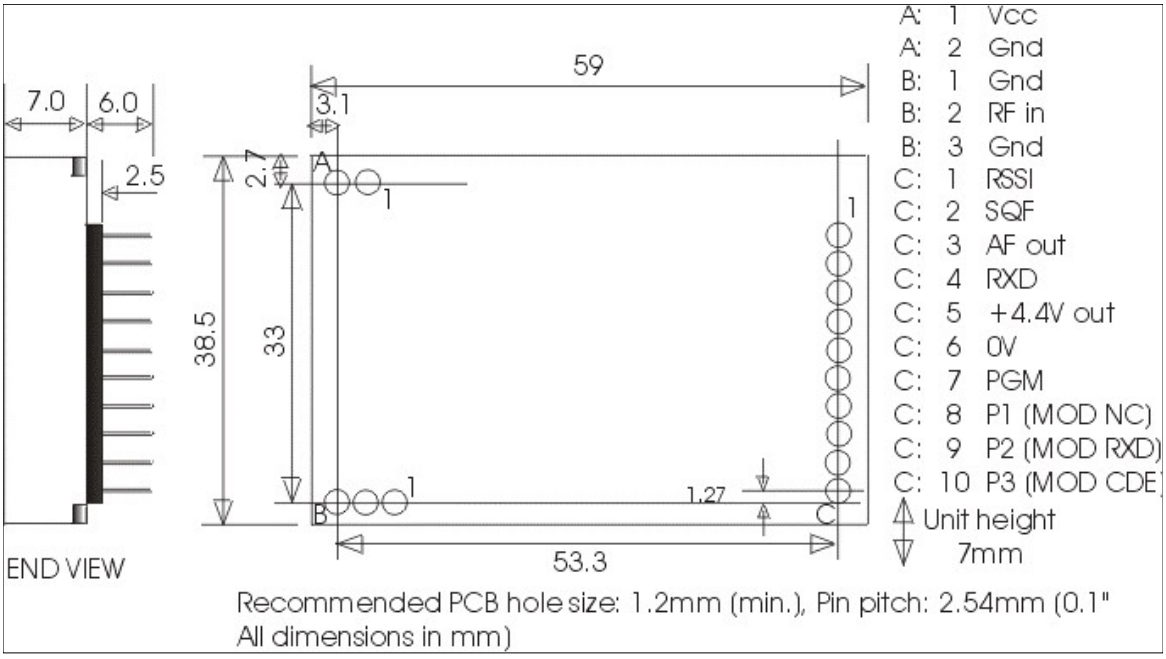

Figure 3: TR2R Footprint (Top) view

Pin Description - TR2R

Pin A	Name	Function
1	+Vin	+4.5-16V DC
2	Gnd	Ground
Pin B	**Name**	**Function**
1	Gnd	RF ground
2	RF out	To the antenna
3	Gnd	RF ground
Pin C	**Name**	**Function**
1	RSSI	DC level between 0.5V and 2.5V. 60dB dynamic range
2	SQF	Noise operated carrier detect. Open collector. ON/low = no signal
3	AF out	200mV$_{pk-pk}$ audio. DC coupled, approx 1V bias. Muted by squelch
4	RXD	Open collector output of data slicer. Need external pull-up
5	+4.4V out	DC supply. 75mA maximum drain. Present if unit is powered.
6	0V	Ground
7	PGM	Serial programming/configuration input at RS232 level
8	P1 (MOD NC)	Parallel frequency select inputs. Inverted logic, 10k pullups to 4V
9	P2 (MOD RXD)	
10	P3 (MOD CDE)	Momentary Read back output for ? and = commands only

***NOTES*:**

1. *Carrier detect on TR2R mutes the AF and DATA outputs when RF input signal is <-123dBm. This can be factory disabled if required.*
2. *There are no pullups on the open collector outputs. External pull-up resistor should be used.*
3. *In serial mode, the P3 (pin 10) is also used as an read back output*
4. *With 1200baud modem mode enabled, parallel selection of channel is unavailable as the P1-P3 lines are used for input/output operations.*

TR2R 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 pin.

Command Format	Description
SINGLE nnnnn	Set value of N for single channel operation
GOCHAN xx	Serial select of channel xx (0 to 127)
LOADMX xx	Set highest permitted (serial selected) channel xx (others default to ch0)
LOADaa 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). Disable modem
SETSER	Channel selected by most recent GOCHAN operation
SETMOD	Enable internal modem. Frequency selected by most recent GOCHAN or SINGLE
OFFSET ooo	Set receive frequency offset (for 25KHz this is 1800)
INCREM i	Sets the increment (in units of the comparison frequency) between channels in the sequential table (channels 16-127)
=	Complete dump of all 64 bytes of the internal E2PROM (00-3F)
<CR>	Process entry (Carriage Return = 0D hex)
?	Channel read back (returns current value of N register) – see note below
/	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) ooo = frequency offset i = single digit value, from 0 to 7	

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

Internally, the TR2R receiver uses a 45MHz IF, but it is desirable for the customer to simulate a unit with a 21.4MHz IF (for compatibility with interfaces designed for other receivers already in service).
This is easily achieved by supplying the units with an OFFSET value of 944

$$OFFSET = \frac{45MHz - 21.4MHz}{25kHz} = 944$$

The calculation for the N value then becomes this:

$$N = \frac{f - 21.4MHz}{f_{Channelspacing}} = \frac{458.525\,MHz - 21.4MHz}{25kHz} = 17485$$ CH0:458.525MHz

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*

Read back

The TR2R includes a simple read back function.

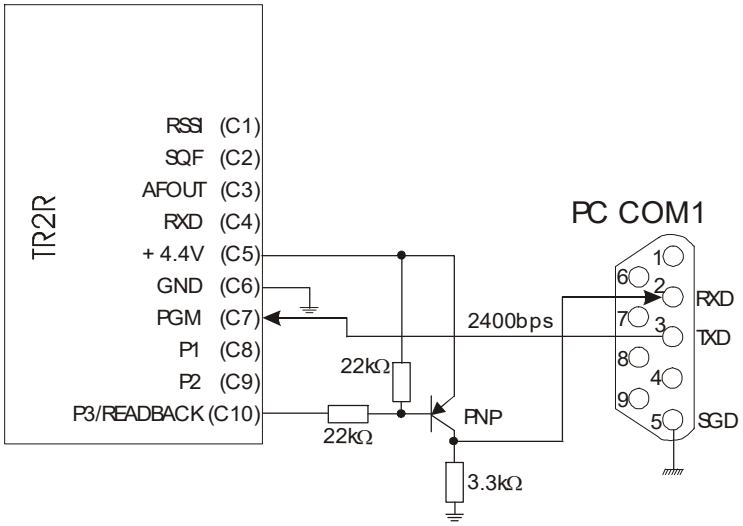

Figure 4: TR2R Programming and Readback Interface

On receiving an ASCII 0x3F (the question mark ? character) the unit reprograms P3 (pin 10) to be an output and then uses it to send (in inverted "RS232" 1+8+1, no parity at 2400 baud) the current value of the N register.

After the end of the second byte, P3 becomes an input again. It outputs the MSB first, then the LSB. There is a 2ms delay between receiving the command and starting to output the MSB. Then there is a 2ms delay between the bytes.

This read-back function MUST NOT be used when the units are in modem mode.

Following examples shows how to read N value programmed for Channel 2.

/GOCHAN 2<cr> Clear PGM buffer, Go to Channel 2 (serially select channel 2)
? Read N value of serially selected channel

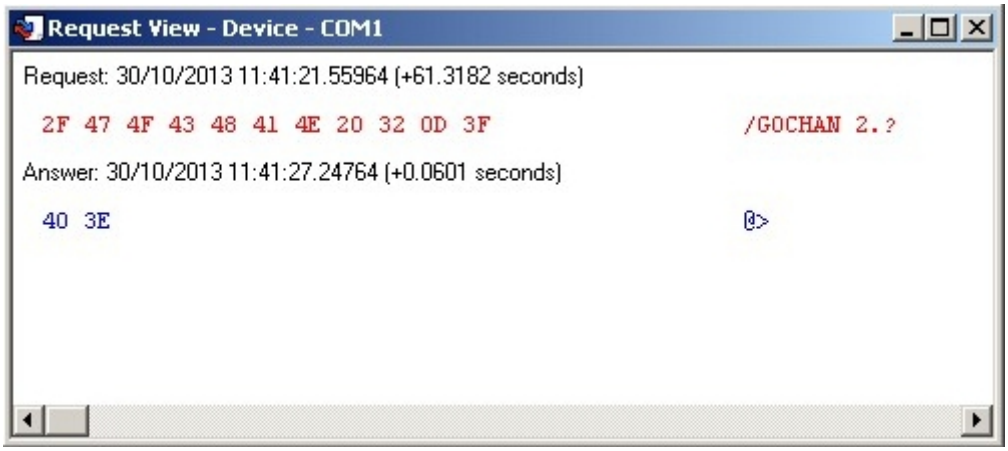

Figure 5: TR2R-432.5-10 N value read-back output in Hex format

Programmed and Read-back N value for CH2:432.550MHz is 0x403E (16444)

$$N_{CH2} = \frac{f - 21.4MHz}{f_{Channelspacing}} = \frac{432.550MHz - 21.4MHz}{25kHz} = 16446$$

Following example shows = command into PGM input to read the EEPROM contents of TR2R-432.5-10

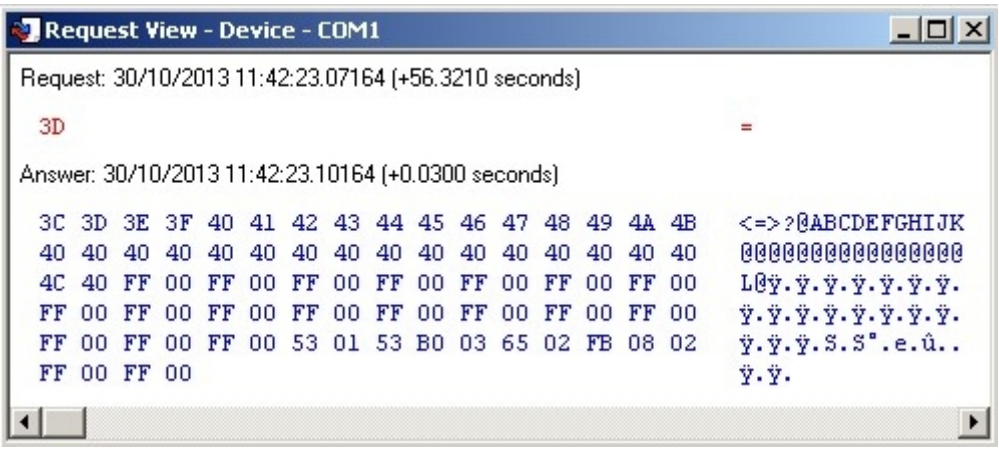

Figure 6: TR2R-432.5-10 EEPROM contents in Hex format

EEPROM Address	Content Description
00-15 (1st row)	N register Least Significant Bytes (Channels 0-15) e.g. 3E for CH2
16-31 (2nd row)	N register Most Significant Bytes (Channels 0-15) e.g. 40 for CH2
32	N value for start of table (LSB) CH16 e.g. 0x4C for CH16:432.900MHz
33	N value for start of table (MSB) CH16 e.g. 0x40 for CH16:432.900MHz
34-51	UNUSED
52	reserved: normally reads as 53 hex
53	INCREM 1 for 25kHz frequency step for CH16-CH240
54	reserved: normally reads as 53 hex
55	Receiver OFFSET LSB e.g. 0xB0 (lsb) of 944 (0x03B0)
56	Receiver OFFSET MSB e.g. 0x03 (msb) of 944 (0x03B0)
57	Highest serially selectable channel set using LOADMX 100 command. e.g. CH100 = 435MHz. 0x65 (101) and above cannot be selected
58	serial mode channel number e.g. 0x02 for serially selected Channel 2
59	TR2R MODE mode bit 2 set = 'single' (volatile) mode bit 1 set = serial / table mode bit 0 set = parallel, and not a modem bit 0 clear = modem e.g. 0xFB (011) for Serial Channel Selection, Non-Modem
60	R register LSB e.g. 0x08 for 520 (0x0208)
61	R register MSB e.g. 0x02 for 520 (0x0208)
62-63	UNUSED

Condensed specifications

Frequency	458.5-459.1MHz or 433-434MHz (any 5MHz band from 420-475MHz)
Frequency stability	+/- 1.5kHz
Channel spacing	25kHz (12.5kHz by special order)
Number of channels	128 channels controlled via RS232 interface (8 parallel selected)
Supply *voltage*	4.5-16V
Current	27mA receive
Operating temperature	-20°C to +70°C (Storage -30°C to +85°C)
Size	59 x 38 x 10 mm
Spurious radiations	Compliant with ETSI EN 300 220-2 and EN 301 489-3
Interface	
user	8pin 0.1" pitch molex
Power	2pin 0.1" pitch molex
RF	3pin 0.1" pitch molex
Recommended PCB hole size	1.2mm (min.)
Receiver	
Sensitivity	-118dBm for 12 dB SINAD
image / spurious	-80dB
Blocking	>86dB
adjacent channel -910kHz	65dB 69dB
½ IF	>80dB
Outputs	RSSI, carrier detect, audio, data
Power on to valid audio	28ms (no noise mute)
Power on to valid audio	45ms (with noise mute)
Power on to stable data out	50ms for 50:50 mark / space (with or without mute)

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

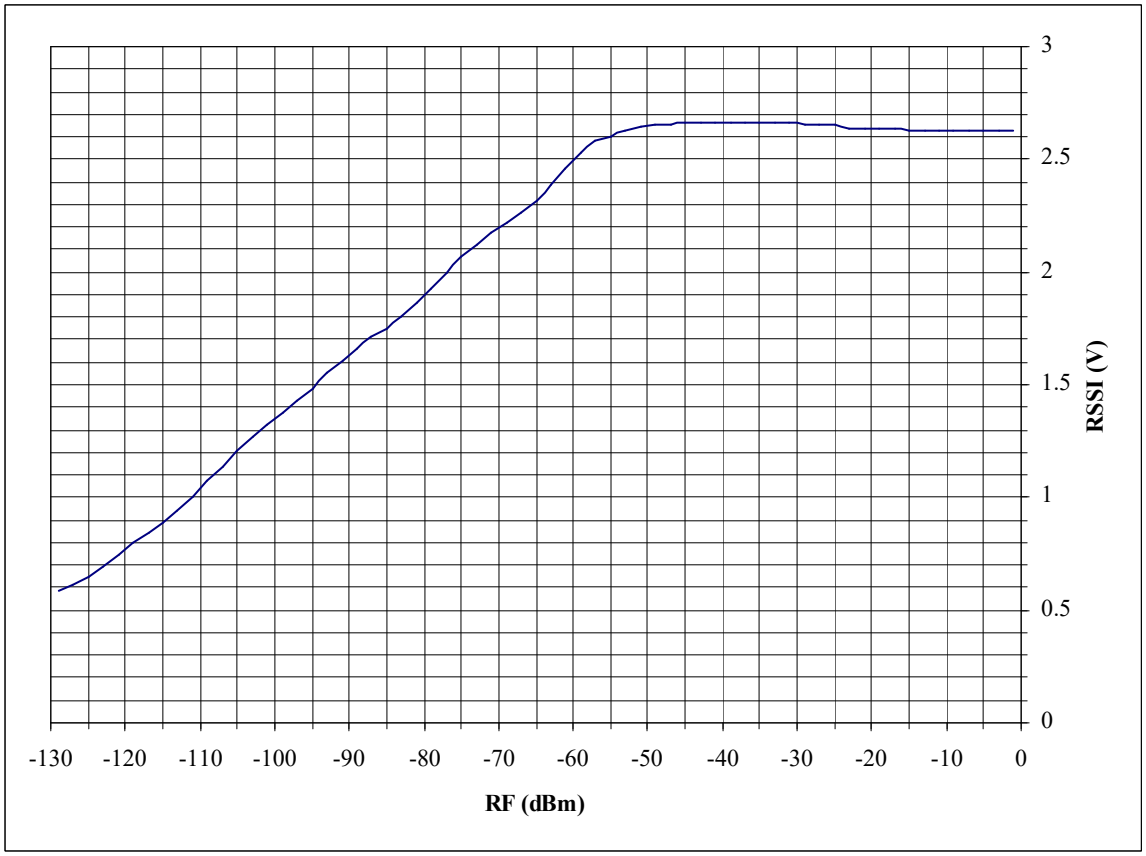

Figure 7: TR2R Received Signal Strength Indicator (RSSI) vs. RF input level

Ordering information

Part No.	Frequency band	Data rate (max)
TR2R-433-10	433.05MHz - 434.790MHz	10kbps
TR2R-458-10	458.525MHz - 459.100MHz	10kbps

Note: Also available in any 3MHz band from 420 - 475MHz

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

Copyright notice

Limitation of liability

The information furnished by Radiometrix Ltd is believed to be accurate and reliable. Radiometrix Ltd reserves the right to make changes or improvements in the design, specification or manufacture of its subassembly products without notice. Radiometrix Ltd does not assume any liability arising from the application or use of any product or circuit described herein, nor for any infringements of patents or other rights of third parties which may result from the use of its products. This data sheet neither states nor implies warranty of any kind, including fitness for any particular application. These radio devices may be subject to radio interference and may not function as intended if interference is present. We do NOT recommend their use for life critical applications.
The Intrastat commodity code for all our modules is: 8542 6000

Radio Equipment Directive (RED)

Before it can be placed on the UK market, radio control equipment must first comply with the provisions of the Radio Equipment Directive 2014/53/EU

To comply, all equipment must meet a set of Essential Requirements that are based on voluntary Harmonised European Standards. Manufacturers can meet the essential requirements by ensuring equipment meets the applicable harmonised standards or by seeking the opinion of a Radio Equipment Directive Notified Body. Once this assessment has been carried out, the manufacturer can declare compliance, affix the CE mark to the equipment and then place it on the market anywhere in the European Community.

https://www.ofcom.org.uk/spectrum/information
https://www.ofcom.org.uk/spectrum/rules/
https://ec.europa.eu/docsroom/documents/33162