Features

- Miniature SIL package
- Fully shielded
- Data rates up to 128kbits/sec
- Range up to 300 metres
- Single supply voltage
- Industry pin compatible

T5-434

- Temp range -20°C to +55°C
- No adjustable components
- High shock resistance
- Temperature compensated RF output

R5-434

- High sensitivity
- Analogue / Digital Outputs
- Signal strength output (RSSI)
- On board AGC
- Single conversion FM Super-Het
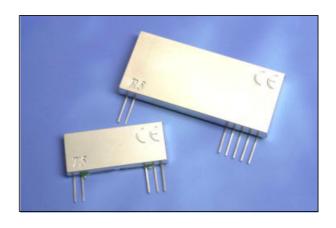- Double RF filtering (inc saw front end)

Applications

- Vehicle alarm systems
- Remote gate controls
- Garage door openers
- Domestic and commercial security

General Description

The T5 and R5 data link modules are miniature UHF radio modules, which enable the implementation of a simple telemetry link upto 300 metres, and at data rates of up to 128Kbit/s

The T5 and R5 modules will suit one-to-one and multi-node wireless links in applications including building and car security, remote industrial process monitoring and computer networking.
The 'B' derivative parts offer a cost reduced version.

The receiver is based on the classical superhet single conversion architecture utilising a PLL xtal referenced oscillator which yields a highly stable IF frequency (10.7 MHz). This hence allows use of high Q bandpass filters offering excellent adjacent channel rejection and hence high interference Immunity.

Because of its small size and low power requirements, these modules are ideal for use in portable battery powered wireless applications.
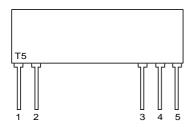
Connection Diagram

Figure 1: Transmitter

Figure 2: Receiver

Pin Descriptions:

RF GND *(pin 1)*
RF ground pin, internally connected to pin 4 (0V). This pin should ideally be connected to the nearest ground plane (e.g. coax braid, main PCB ground plane etc.)

RF OUT *(pin2)*
50Ω RF antenna output. To achieve best results the antenna impedance must match that of the module.

V$_{CC}$ *(pin 3)*
+Ve supply pin (3.0 to 9.0 volts). The module will generate RF when V$_{CC}$ is present. It is strongly recommended that a 100nF capacitor decouples the supply rail as close as possible to this pin.

GND *(pin 4)*
Supply and data ground connection, connected to pin 1.

Data IN *(pin 5)*
This input has an impedance of 47KΩ and should ideally be driven by a CMOS logic drive or compatible. The drive circuitry should be supplied with the same supply voltage as the Tx module.

Ordering Information:

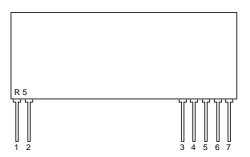| Part No	Description
T5-434-9-20	Tx 433.92MHz 9v 20Kbps
T5-434-5V	Tx 433.92MHz 5v 50Kbps
T5-434-5-20B	Tx 433.92MHz 5v 20Kbps 'B part'
T5-434-3V	Tx 433.92MHz 3v 50Kbps
T5-434-3-20B	Tx 433.92MHz 3v 20Kbps 'B part'
T5-434-128	Tx 433.92MHz 5v 128Kbps

RF IN (pin 1)
50? RF input from antenna, connect using shortest possible route. This input is isolated from the internal circuit using the air gap of the front end SAW RF filter

RF GND (pin 2)
RF ground connection, preferable connected to a solid plane.

RSSI (pin 3)
The Received Signal Strength Indicator provides a DC output voltage proportional to the RF input signal. The amplitude of the RSSI voltage increases with increasing RF signal strength.

GND (pin 4)
Connect to power supply ground.

V$_{CC}$ (pin 5)
+Ve supply pin. Operation from a 5V supply able to source6mA at less than V$_{p-p}$ ripple.

AF (pin 6)
Audio frequency output.

DATA OUT (pin 7)
CMOS compatible output. This may be used to drive external decoders.

Part No	Description
R5-434-5-20	Rx 433.92MHz 20Kbps
R5-434-5-20B	Rx 433.92MHz 20Kbps 'B part'
R5-434-5-50	Rx 433.92MHz 5V 50Kbps
R5-434-5-50B	Rx 433.92MHz 5V 50Kbps 'B part'
R5-434-5-128	Rx 433.92MHz 5V 128Kbps

Absolute Maximum Ratings: Transmitter T5

Operating temperature:	-20°C to +55°C
Storage temperature:	-40°C to +100°C
Supply Voltage (pin 3)	10V
Data input (pin 5)	10V
RF Out (pin 2)	±50V @ < 10MHz , +20dBm @ > 10MHz

Electrical Characteristics: Transmitter T5

	pin	Min.	typ.	Max.	units	notes
DC LEVELS						
Supply voltage 3V Versions	3	2	3.0	4	Volts	
Supply voltage 5V Versions	3	4.5	5.0	5.5	Volts	
Current & RF POWER						
Standard T5 Devices						
Supply current @ V_{CC} = 5V	3			12	mA	1
RF power	2		9	+12	dBm	1
T5'B' Devices						
Supply current @ V_{CC} = 3V	3	4	6	8	mA	1
Supply current @ V_{CC} = 5V	3	5.5	8	9.5	mA	1
RF power @ V_{CC} = 3V	2	3		+7	dBm	1
RF power @ V_{CC} = 5V	2	7		+10	dBm	1
RF & Data						
2nd harmonic			-50		dBc	1
Harmonics @ > 1GHz			-46		dBc	1
Initial frequency accuracy			±50		KHz	
Overall frequency accuracy			±75		KHz	
Modulation bandwidth @ -3dB			10		KHz	
Modulation distortion (THD)					%	
Power up time to full RF			10		µs	
Standard T5 Devices						
Data rate Standard				50000	bits/s	
Data pulse width		40			µs	
T5'B' Devices						
Data rate Standard				20,000	bits/s	
Data pulse width		500			µs	

Notes
 1. Measured into a 50Ω impedance
 2. The limit for European spec EN300-220 is –36dBm

Absolute Maximum Ratings: Receiver R5

Operating temperature: -10°C to +55°C
Storage temperature: -40°C to +100°C

Supply Voltage (pin 5)   7V
RF Input (pin 1)   +20dBm

Electrical Characteristics: Standard Receiver R5

	min.	typ.	Max.	units	notes
DC LEVELS					
Supply voltage	4.5	5.0	5.5	Volts	
Supply current		6		mA	
Supply ripple	-	-	10	mV$_{p-p}$	
Data output high		=>4.0		V	
Data output low		<=0.5		V	
RF					
RF sensitivity		-105		dBm	
IF Bandwidth		230		KHz	1
Initial signal accuracy		±25		KHz	
Max. RF input		20		dBm	
E.M.C					
Spurious responses upto 1GHz		<60		dB	
LO leakage, conducted		<60		dBm	
LO leakage, radiated		<60		dBm	
Image Rejection		50		dBm	
Dynamic Timings					
Power up to stable data		30	35	mS	20Kbps Part
(With RF signal present)		5	7	mS	50Kbps Part
		5	7	mS	128Kbps Part
Signal to stable data			2.5	mS	20Kbps Part
(With power supply already on)			1	mS	50Kbps Part
	0.5		1	mS	128Kbps Part
Power up to valid RSSI *(With RF signal present)*			1	mS	All Versions
Data Pulse Widths	50		6000	uS	20Kbps Part
(SeeNote 2)	20		700	US	50Kbps Part
	7		300	uS	128Kbps Part

1. IF bandwidth available down to 27KHz
2. The data slicer is optimised for a 50:50 duty cycle, hence for reliable communications data should be encoded using a suitable scheme such as Manchester Encoding, though pulse width modulation up to 30:70/70:30 can also be utilised.

Electrical Characteristics: Receiver R5 'B' Parts

	min.	typ.	Max.	units	notes
DC LEVELS					
Supply voltage	4.5	5.0	5.5	Volts	
Supply current		6		mA	
Supply ripple	-	-	10	mV$_{p-p}$	
Data output high		=>4.0		V	
Data output low		<=0.5		V	
RF					
RF sensitivity		-103		dBm	
IF Bandwidth		230		KHz	1
Initial signal accuracy		±22		KHz	
Max. RF input		20		dBm	
E.M.C					
Spurious responses upto 1GHz		<60		dB	
LO leakage, conducted		<60		dBm	
LO leakage, radiated		<60		dBm	
Image Rejection		60		dBm	
Dynamic Timings					
Power up to stable data		30	35	mS	20Kbps Part
(With RF signal present)		5	7	mS	64Kbps Part
Signal to stable data			2.5	mS	20Kbps Part
(With power supply already on)			1	mS	64Kbps Part
Power up to valid RSSI *(With RF signal present)*			1	mS	All Versions
Data Pulse Widths	50		6000	uS	20Kbps Part
(SeeNote 2)	20		700	uS	50Kbps Part

3. IF bandwidth available down to 27KHz
4. The data slicer is optimised for a 50:50 duty cycle, hence for reliable communications data should be encoded using a suitable scheme such as Manchester Encoding, though pulse width modulation up to 30:70/70:30 can also be utilised.
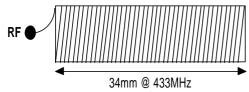
Antenna Design

The design and positioning of the antenna is as crucial as the module performance itself in achieving a good wireless system range. The following will assist the designer in maximising system performance.

The antenna should be kept as far away from sources of electrical interference as physically possible. If necessary, additional power line decoupling capacitors should be placed close to the module.

The antenna 'hot end' should be kept clear of any objects, especially any metal as this can severely restrict the efficiency of the antenna to receive power. Any earth planes restricting the radiation path to the antenna will also have the same effect.

Best range is achieved with either a straight piece of wire, rod or PCB track @ ¼ wavelength (15.5cm @ 433.92MHz). Further range may be achieved if the ¼ wave antenna is placed perpendicular in the middle of a solid earth plane measuring at least 16cm radius. In this case, the antenna should be connected to the module via some 50 ohm characteristic impedance coax

Application Circuit

The application circuits show how the T5 transmitter and the R5 receiver can easily be integrated into a system to form a wireless link.
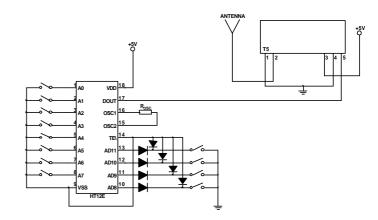
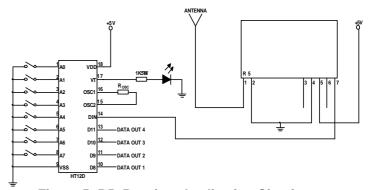**Figure 4: T5 Transmitter Application Circuit**

Figure 5: R5 Receiver Application Circuit

Helical Antenna

34mm @ 433MHz

17 turns equally spaced
$\varnothing$ = 5mm (inside)

Whip Antenna

15.5cm @ 433MHz

**Figure 3: Antenna Configurations To Be Used
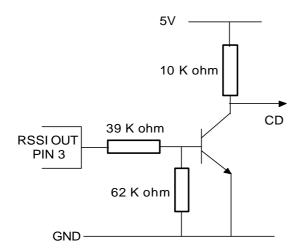With The T5 & R5 Modules**

RSSI Values:

The R5 RSSI output provides a DC output proportional to the RF input signal. The table below shows the typical RSSI value depending on the RF signal strength. The circuit diagram shows how a carrier detect can be obtained from the RSSI pin on the receiver module.

RF Signal Strength / dBm RSSI / V

RF Signal Strength / dBm	RSSI / V
-120	1.27
-110	1.33
-100	1.49
-90	1.74
-80	1.99
-70	2.3
-60	2.56
-50	2.63
-40	2.63

Carrier Detect circuit

The R5 RSSI output provides a DC output proportional to the RF input signal. In order to generate a Carrier Detect (as a logic level) The following circuit may be used.
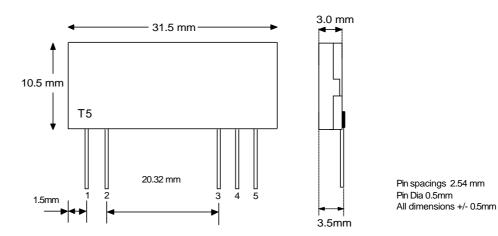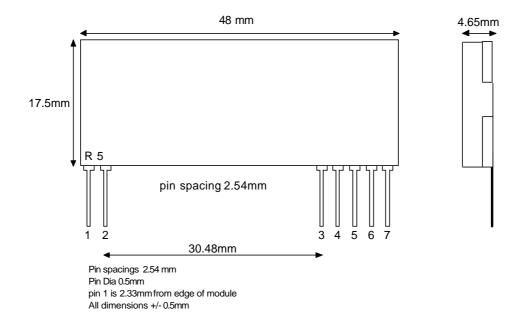
Mechanical Dimensions

31.5 mm

3.0 mm

10.5 mm

T5

20.32 mm

1.5mm

1 2   3 4 5

3.5mm

Pin spacings 2.54 mm
Pin Dia 0.5mm
All dimensions +/- 0.5mm

Figure 6: Transmitter

48 mm

4.65mm

17.5mm

R 5

pin spacing 2.54mm

1 2   3 4 5 6 7

30.48mm

Pin spacings 2.54 mm
Pin Dia 0.5mm
pin 1 is 2.33mm from edge of module
All dimensions +/- 0.5mm

Figure 7: Receiver

Should you require further assistance please contact :
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