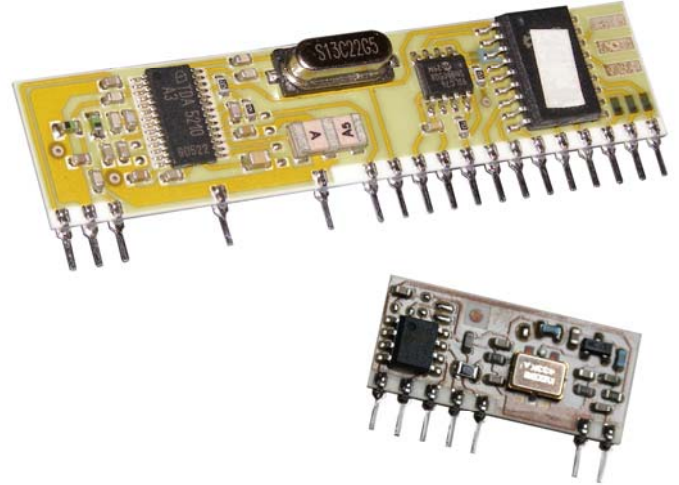# SmartRadio Transmitter / Receiver

- Easy to use Radio Transmitter & Receivers
- AM Radio Hybrid Technology
- Supports **Data** or **Telemetry** communications
- Simple CMOS/TTL Data Interface
- Automatic data encryption / decryption
- Host Interface up to 19200 Baud
- Optional host Flow Control
- On Board Buffer
- Transmit Range Up To 100m
- 2 Telemetry Lines.
- Operates from –20 to +85°C

Applications

- Wireless Security Systems
- EPOS Terminal and meter Reading
- Wireless RS232
- Sensor Data logging
- Remote Telemetry & Telecommand

Description

The RF620 Smart Radio modules provide low cost reliable wireless data communications.

The modules enable a simple 'plug & play' solution, providing a direct radio link for either a serial data stream (CMOS/TTL) or 2 remote control telemetry lines.

The modules contain integrated microprocessors which perform the necessary encryption to optimise the data for transmission by radio. This ensures the maximum range and reliability.

In the non-learned mode, all RF620R receiver modules within range of the. RF620T transmitter module will transparently decode and output the data sent to them over the RF link.

If a secure point to point link is required then the RF620R receiver can be matched to the RF620T transmitter by a simple learn procedure. This also allows several separate point to point links to communicate consecutively in the same area.

Possible applications include one-to-one and multi-node wireless links in applications including car and building security, EPOS and inventory tracking, remote industrial process monitoring and computer networking. Because of their small size and low power requirements, both modules are ideal for use in portable, battery-powered applications such as hand-held terminals.

Part Numbering

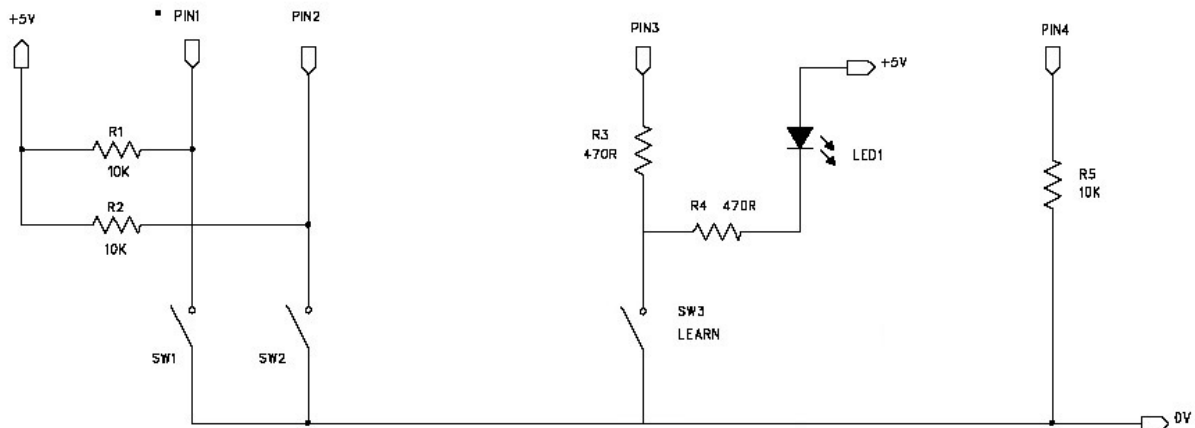| Part Number	Description
RF620TA	Smart Radio Transmitter Module, AM 433MHz
RF620RA	Smart Radio Receiver Module, AM 433MHz

SmartRadio Transmitter / Receiver

RF620T - Pin Description

Pin No	Name	Description	
1	*Input 1 OR* *\Serial Data*	Telemetry Mode:	Data input 1. CMOS/TTL level
		Serial Mode:	Serial data Input, active low. CMOS/TTL level
2	*Input 2 OR* *\CTS*	Telemetry Mode:	Data input 2. CMOS/TTL level
		Serial Mode:	\CTS data output, active low. CMOS/TTL level
3	*\Learn & \LED*	Dual function: Programming Switch input, When grounded places the module into 'learn' mode. External LED output, Indicates data reception, and programming status.	
4	*Mode*	GND via 10K resistor:	Telemetry Mode
		Vcc via 10K resistor:	Serial Mode
5	*ANT*	Connect Antenna to this input	
9	*GND*	Ground	
10	*Vcc*	+5V Supply Voltage	

RF620T – Serial Application circuit
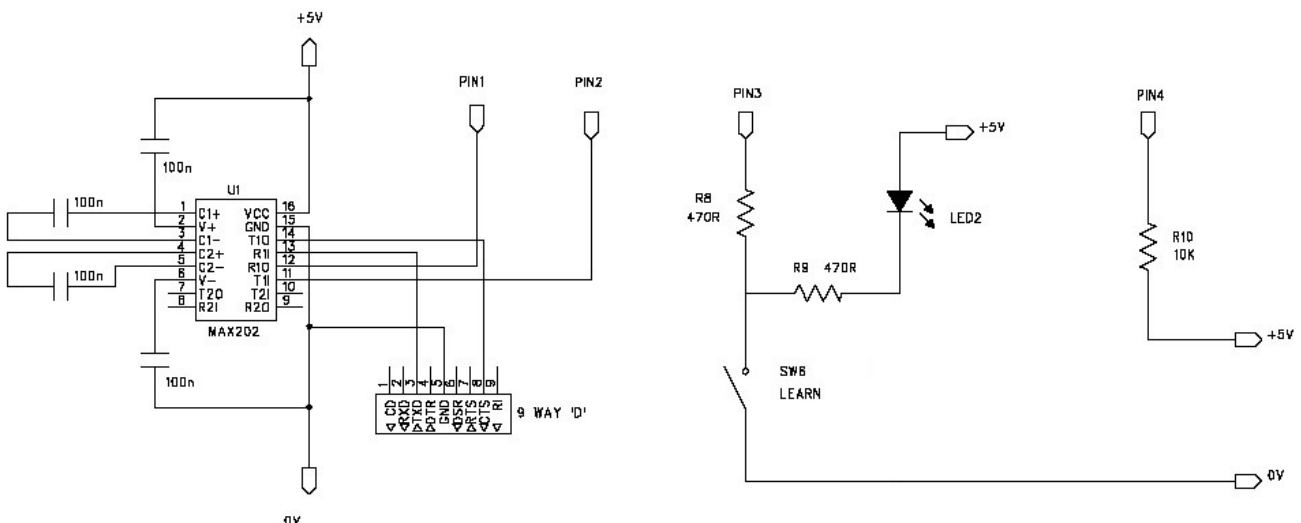
RF620T – Telemetry Application circuit

RF620R - Pin Description

Pin No	Name	Description
1	*Vcc-RF*	+5V Supply Voltage – RF section.
2	*GND-RF*	RF Ground.
3	*ANT*	Connect Antenna to this input.
7	*GND-RF*	RF Ground.
11	*GND-AF*	AF Ground.
13	*RSSI*	Received Signal Strength Indicator (RSSI)
14	*O/P-AF*	Raw Data output from RF receiver (CMOS/TTL signal)
15	*Vcc-digital*	+5V Supply Voltage – digital section.
16	*GND-digital*	AF Ground – digital section.
17	*MCLR*	Pulls Microcontroller into reset if connected to Ground May be left unconnected if not required (internally tied high)
19	*\Serial Data*	Serial data output, active low
20	*\RTS*	/RTS input, active low
21	*\Learn* *&* *\LED*	Dual function: Programming Switch input, When grounded places the module into 'learn' mode. External LED output, Indicates data reception, and programming status.
22	*spare*	leave unconnected
23	*spare*	leave unconnected
24	*O/P1*	Data Output 1. (has a 220Ω series resistor)
25	*O/P2*	Data Output 2. (has a 220Ω series resistor)

RF620R - Typical application circuit
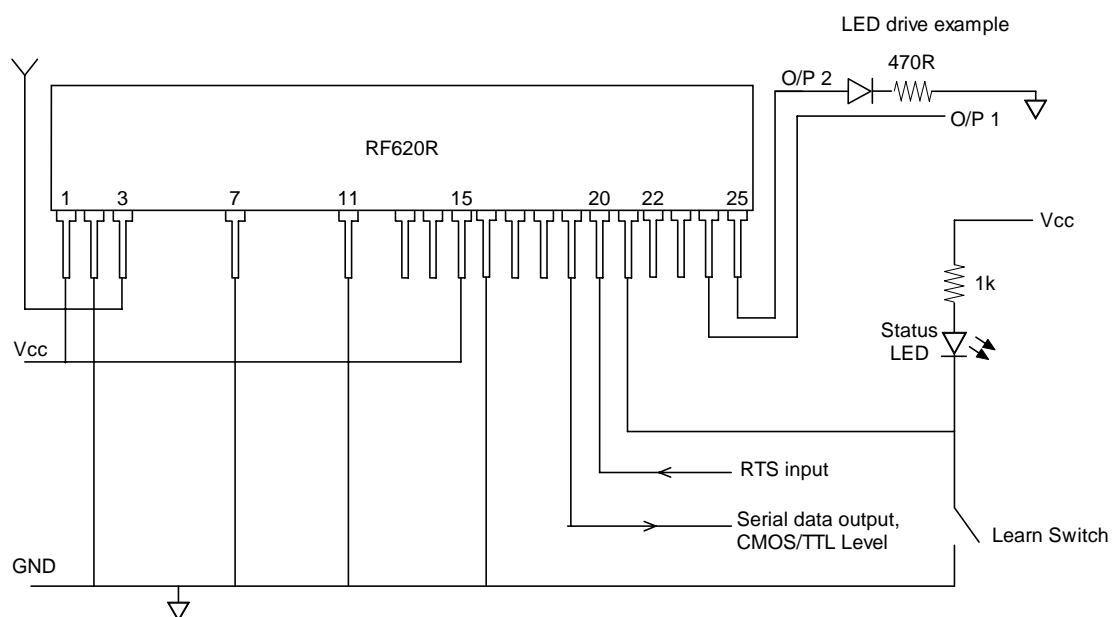
Serial Data Mode (mode pin pulled high via 10K resistor)

Operating mode

The RF620T transmitter has a serial data input and a /CTS handshake output which allows the module to turn off input data flow if required. Serial data fed into the RF620T is stored in a 50 word buffer and when this is full the /CTS handshake line is raised to indicate to the host system that it should stop sending data. A further 5 words may be sent and are buffered without data corruption. In the event that a shorter data packet than 50 words is input or if there is a long inter-word delay then after data flow has ceased for 10 character times at the current baud rate the /CTS handshake will be raised and the part packet immediately transmitted. After each data packet has been sent the transmitter will only drop its /CTS output to enable host data flow when the data has been transmitted over the radio path and when the associated RF620R has had time to output the data to its receiving host.

The RF620R receiver has a serial data output and an /RTS handshake input which allows the receiving host to turn off output data flow if required. It should be noted that this handshake must be used with care since if it is held high (disabled) then received data may be lost. If it is not required to use the \RTS handshake line it should be held at ground level.

Learn/erase procedure and auto baud function

The following procedure should be followed if it is required to learn an RF620T to an RF620R or if it is required to use the auto baud function. This latter function allows the baud rate of the serial data input to the RF620T to be set to any of the following rates: 1200, 2400, 4800, 9600* or 19200 bauds (* indicates default setting). The format of the data stream is 8 data bits, 1 stop bit and no parity. Note that at all times the baud rate of the associated RF620R module is the same as that of the RF620T module since each data packet transmitted by the RF620T specifies its current host data rate and this is used by the RF620R to set its serial data rate.

RF620T: The learn button is pressed, the learn LED will come on and then go off when the button is released. After 2 seconds the unit will transmit a learn packet, display the current baud rate as a series of LED flashes and then idle with the LED off for 5 seconds.

Current baud rate	LED flashes	
19200	1	
9600	2	(default)
4800	3	
2400	4	
1200	5	

These functions will be repeated 20 times. If serial data is input to the unit then the auto-baud function will be carried out and the revised baud rate displayed as a series of flashes. The auto-baud function will only be carried out once in any given learn session and during auto-baud detection the host data flow into the module should consist of a stream of characters at the desired baud rate and which lasts for at least 10 seconds. It is recommended that for best performance of the auto-baud function that a stream of the letter 'R' be sent.

RF620R: the learn button is pressed, the learn LED will come on and remain on when the button is released. When a learn packet from an RF620T is received, the RF620T address will be saved to eeprom in the RF620R and the LED will flash 5 times to indicate that the learn has been successful. The mode will terminate after 60 seconds if no learn packet is received.

If it is required to erase the learned address in the RF620R then the learn button should be pressed and held for more than 8 seconds and then released after which time the LED will flash rapidly to indicate that erase of the address has taken place. Note that in this state the RF620R will respond to any RF600T.

Telemetry Mode (mode pin pulled low via 10K resistor)

Operating mode

The status of the RF620T's two logic level telemetry inputs will be mirrored on the two telemetry outputs on the RF620R.
The input states are transmitted:

- At power up
- Every 2 seconds
- After any change of state

Learn/erase procedure

In systems where only one pair of RF600T and RF600R modules is used, no learn is necessary. In the event that more than one RF600T is in range of an RF600R then the RF620R will receive transmissions from all in-range RF620T modules, controlling its telemetry channels in response to all received data packets. In this case it will normally be necessary for each RF600R to learn the identity of a single RF600T and this can be carried out in the following manner.

RF620T: the learn button is pressed, the learn LED will come on and remain on when the button is released. The unit will transmit a learn packet and the LED will be turned off. After 5 seconds another learn packet will be transmitted and the LED will be turned on. Every 5 seconds there-after a learn packet will be transmitted and the LED state reversed and this will continue until 20 learn packets have been transmitted.

RF620R: the learn button is pressed, the learn LED will come on and remain on when the button is released. When a learn packet from an RF620T is received, the RF620T address will be saved to eeprom in the RF620R and the LED will flash 5 times to indicate that the learn has been successful. The mode will terminate after 60 seconds if no learn packet is received.

If it is required to erase the learned address in the RF620R then the learn button should be pressed and held for more than 8 seconds and then released after which time the LED will flash rapidly to indicate that erase of the address has taken place. Note that in this state the RF620R will respond to any RF600T.

Technical Specification – RF620T

Absolute Maximum Ratings

Supply Voltage (+5Vcc to GND)...-0.3 to + 6 Volts.
Storage Temperature..-30 to +85° Celsius.
Operating Temperature.. 0 to +70° Celsius.

For Ambient temperature = 25° Celsius.

Electrical Specification	Min	Typical	Max	Dimension	Note
Supply Voltage	4.5	5.0	5.5	V	Vdd
Supply Current		6		mA	transmitting
		1		mA	idle/receiving
Frequency (custom frequencies available on request)		433.92		MHz	
Input voltage:					
Logic Low			0.8	V	
Logic High	2.0			V	
Level of Emitted Spectrum		-70		dBm	
EMC Compliance	Complies to ETS300-339				

Technical Specification – RF620R

Absolute Maximum Ratings

Supply Voltage (+5Vcc to GND)...-0.3 to + 6 Volts.
Storage Temperature..-30 to +85° Celsius.
Operating Temperature.. 0 to +70° Celsius.

For Ambient temperature = 25° Celsius.

Electrical Specification	Min	Typical	Max	Dimension	Note
Supply Voltage	4.5	5.0	5.5	V	Vdd
Supply Current		6		mA	
Frequency (custom frequencies available on request)		433.92		MHz	
Output voltage:					
Logic Low			0.6	V	I out = 8.5mA
Logic High	Vdd-0.7v			V	I out = -3mA
Output current:					
Logic Low			25	mA	NOTE a
Logic High			-25	mA	
Turn on Time		20		ms	
-3dB Bandwidth		+/- 400		KHz	
Receiver R.F. Sensitivity (100% AM)		-106		dBm	
EMC Compliance	Complies to ETS300-339				

NOTE a: OUTPUT 1 and OUTPUT 2 have internal 220 Ohm resistors in series with the output drive.

Mechanical Details

RF620T

Component Side

25.5
11.5
1.27 2.54
1 5 9 10
3

RF620R

Component Side

63.5
14.5
1.27 2.54
1 3 7 11 13 15 20 25
3

Notes
Dims in mm
Pins on 0.1" pitch
Pin Dims :0.25 x 0.50 mm
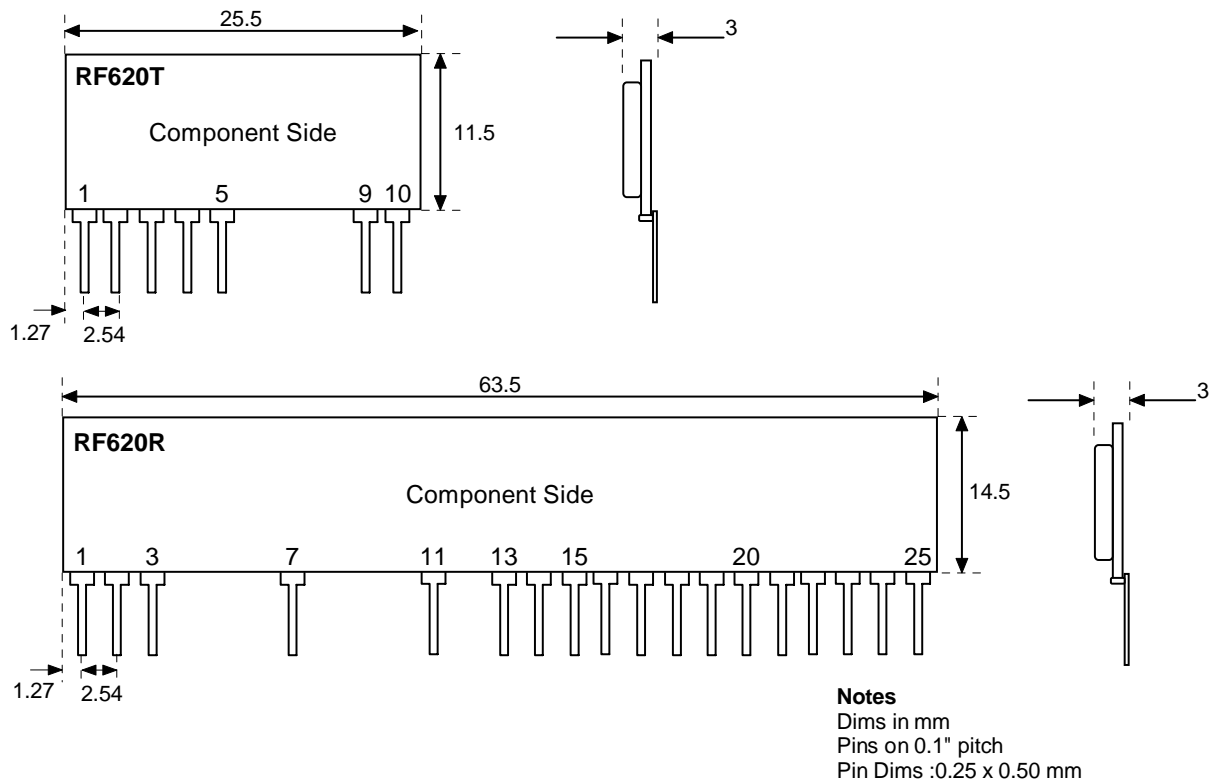
Antenna Design

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 RF ground pin should be connected to a ground plane which should shield the aerial connection and the PCB layout around the aerial track itself should be such as to give a 50 Ohm impedance. The aerial should be kept as far away from sources of electrical interference as physically possible. The specified power supply decoupling capacitors should be placed close to the module as possible and have direct connections to the relevant pins.

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. Earth planes restricting the radiation path of the antenna will also have the same effect.

The best range will be achieved with either a straight piece of wire, rod or PCB track @ ¼ wavelength (17.3cm @ 433.92MHz). Increased range may be achieved if this ¼ wave antenna is placed perpendicular to and in the middle of a solid earth plane measuring at least 16cm radius. In this case, the antenna should be connected to the module using 50 Ohm coaxial cable and the PCB track layout tips given above should be observed.

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