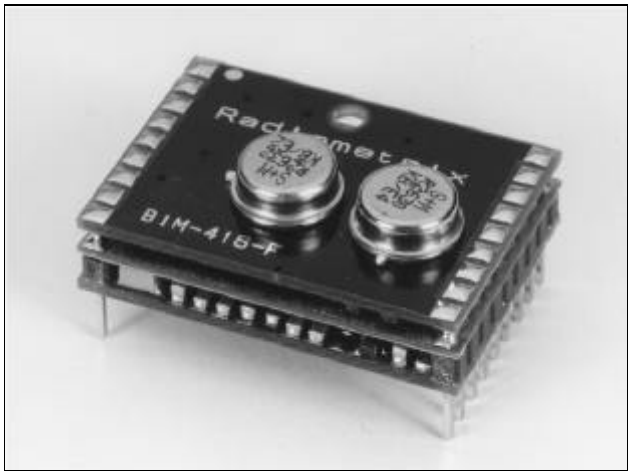
FM R.F. TRANSCEIVER MODULE. FMBIM- 418-F

FEATURES

- DOUBLE CONVERSION SUPERHET RECEIVER.
- SAW CONTROLLED FM TRANSMISSION AT -6dBm ERP.
- -107dBm RECEIVE SENSITIVITY.
- RELIABLE 30 METRE RANGE WITHIN BUILDINGS.
- SINGLE 4.5 to 5.5 VOLT SUPPLY <15mA (TX OR RX).
- HALF DUPLEX AT UPTO 40 Kbit/s.
- CMOS/TTL USER INTERFACE.
- FAST POWER UP ENABLE (1mS) FOR DUTY CYCLE POWER SAVING.
- ON BOARD DATA SLICER, SUPPLY SWITCHES AND ANTENNA CHANGEOVER.
- 418MHz 0.25mW ERP
- 433MHz 10mW ERP
- LICENCE EXEMPT OPERATION IN UK ON 418MHz, MPT 1340 (BiM-418-F).
- ETS 300-220 TESTED FOR EUROPEAN USE ON 433.92 MHz (BiM-433-F).



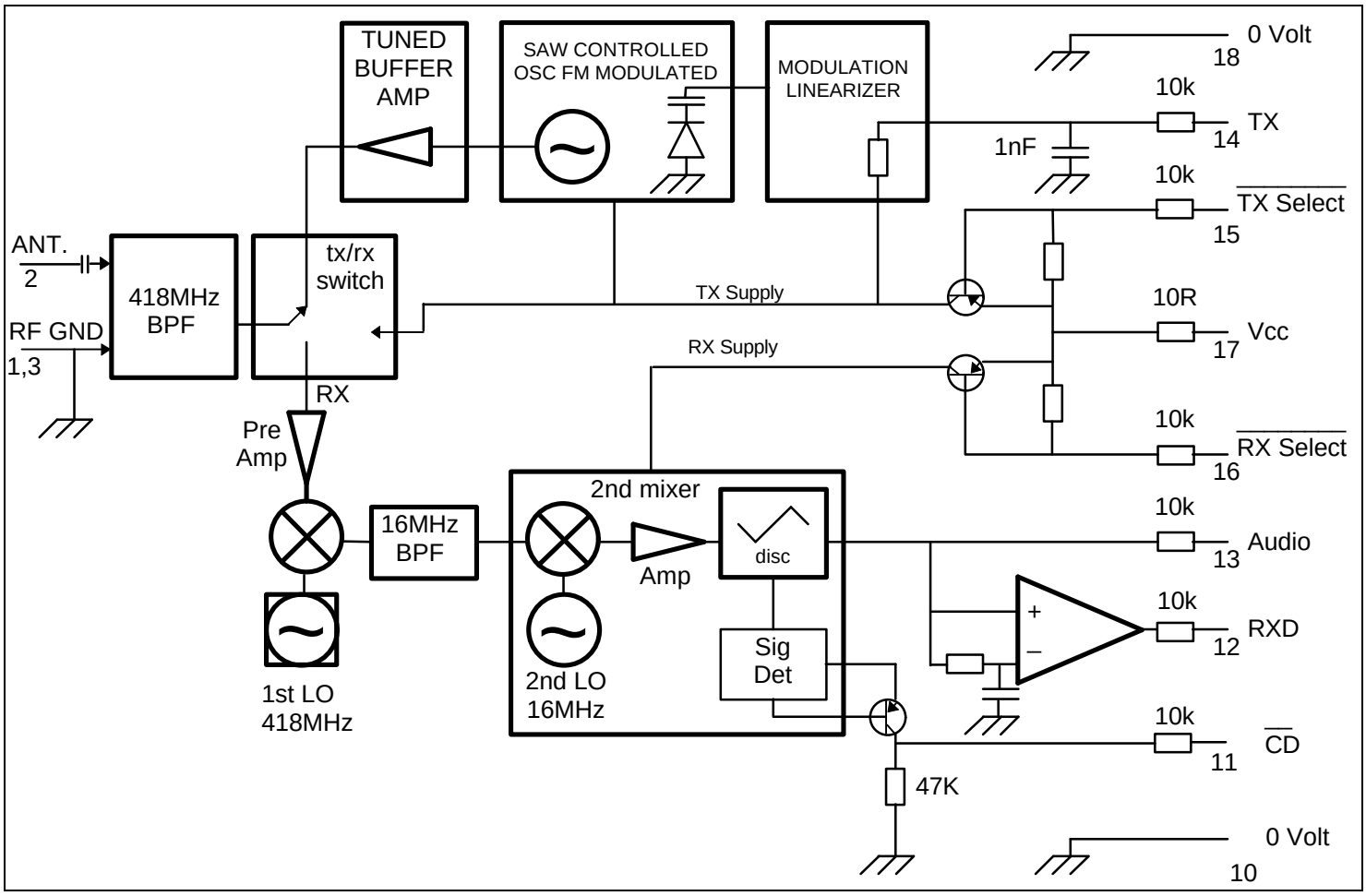
GENERAL DESCRIPTION

The R.F. Solutions FM Radiometrix Transceiver is a miniature UHF radio module capable of half duplex data transmission at speeds upto 40 Kbit/s over distances of 30 metres "in-building" and 120 metres open ground.
Supplied in a miniature PCB mounting module, the unit provides a low cost solution to implement a Bi-directional short range radio data link.
The transceiver integrates a low power UHF FM transmitter and matching superhet receiver together with the data recovery and TX/RX change over circuits.
The high data rates (upto 40Kbit/s) and fast TX/RX changeover (<1mS) make the BiM transceiver ideal for high integrity one to one links / multi-node packet switch networks. Rapid RX power up (<1mS) allows effective duty cycle power saving of the receiver for battery powered applications
The transceiver may be supplied as a bare board or as a custom solution unique to customer-specific requirements. Please contact R.F. Solutions for further information.

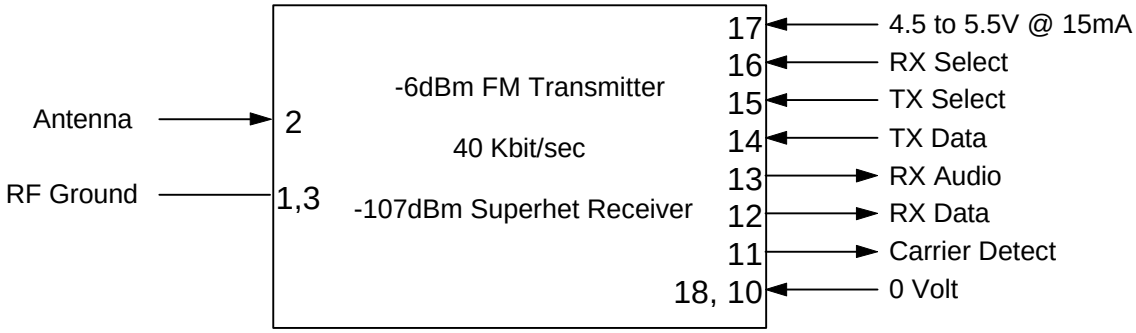
TRANSCEIVER DEVELOPMENT KIT

To aid system design, the Transceiver Evaluation kit provides a ready made communication link which can operate in four different modes. Using an oscilioscope, signals may be monitored, audible and visual informaiton is also provided, to show perfomance of the communication link.

BLOCK DIAGRAM



INTERFACE BLOCK DIAGRAM



PIN DESCRIPTION

Pin No	Name	Description
1 & 3	***RF GND***	These pins should be connected to the ground plane against which the integral antenna radiates . Internally connected to pins 9, 10, 18.
2	***Antenna***	RF input / RF output for connection to an integral antenna. It has a nominal RF impedance of 50Ω and is capacitively isolated from the internal circuit.
9, 10, 18	***Vss***	0 volt connection for the modulation and supply.
11	***CD***	Carrier Detect - A low indicates a signal above the detection threshold is being received. The output is high impedance (50kΩ) and should only be used to drive a CMOS logic input.
12	***RXD***	This digital output from the internal data slicer is a squared version of the signal on pin 13 (AF). This signal is used to drive external digital decoders, it is true data (i.e. as fed to the transmitters data input). The 10kΩ output impedance is suitable for driving CMOS logic. Note: This output contains squared noise when no signal is being received.
13	***RX Audio***	This is the FM demodulator output .It has a standing DC bias of approx. 1.5Volts and may be used to drive analogue data decoders such as modems or DTMF decoders. Output impedance is 10kΩ. Signal level approx. 0.4V pk to pk. We recommend this signal always be available on a convenient test point for diagnostic purposes. Note: Unlike the RXD output which is always true data, this output is true data on the BiM-418 and inverted on the BiM-433.
14	***TXD***	Should be driven directly by a CMOS logic device running on the same supply voltage as the module. Analogue drive may be used but must not drive this input above Vcc or below 0Volts. This input should be held at <0.5 Volt when the TX is not selected to prevent current leak (see block diagram)
15	***TX select***	Active low transmit / receive selects with 10kΩ internal.
16	***RX select***	Pull ups. They may be driven by open collector or CMOS logic
17	***Vcc***	Positive supply. Supply is internally decoupled. Maximum ripple content 50mV pk to pk. **Reverse polarity will destroy the module!**

TX / RX Select Configuration

Pin 15	Pin 16	Function
1	1	Power down (<1μA)
1	0	Receiver enabled
0	1	Transmitter enabled
0	0	Self test loop back

Note - Loop test is at reduced TX power.

ABSOLUTE MAXIMUM RATINGS

Supply Voltage (Vcc to GND).....-0.1 to + 6 Volts.
Voltage on all Input / Output Pins.....-0.1 to Vcc + 0.1 Volts.
Storage Temperature.....-40 to +100° Celsius.
Operating Temperature.....-20 to +55° Celsius.

Warning!:
Do not adjust the trimmer on the module, it controls the receive frequency and can only be correctly set-up with an accurate RF signal generator.

TECHNICAL SPECIFICATION

Ambient temperature = 20° Celsius. Supply Voltage Vcc = 5.0 Volts, unless otherwise stated.

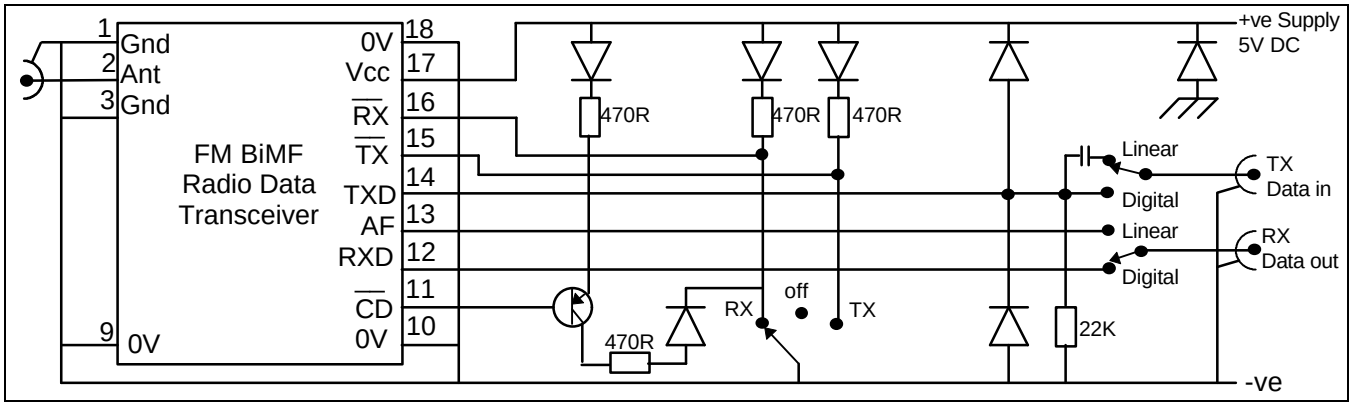
DC ELECTRICAL CHARACTERISTICS	MIN	TYPICAL	MAX	DIMENSION	SEE NOTE
Supply Voltage	4.5		5.5	Volts	
Supply Current					
transmit	8	12	15	mA	
receive	10	12	16	mA	
loop test		20	25	mA	
standby			1	uA	

RF - TRANSMIT CHARACTERISTICS	MIN	TYPICAL	MAX	DIMENSION	SEE NOTE
Radiated Power (ERP)	-10	-6	-3	dBm	1
Transmit frequency (Frf) BiM-418-F		418.000		MHz	
Transmit frequency (Frf) BiM-433-F		433.920		MHz	
Initial frequency accuracy	-75	0	+75	KHz	
Overall frequency accuracy	-95	0	+95	KHz	
Spurious radiation	meets ETS 300-220				
FM deviation (+/-)	15	20	30	KHz	2
Distortion		5	10	%	3
Modulation response @ -3dB	DC		32	KHz	
RF - RECEIVE CHARACTERISTICS					
Receive frequency (Frf) BiM-418-F		418.000		MHz	
Receive frequency (Frf) BiM-433-F		433.920		MHz	
Receiver sensitivity	-100	-107		dBm	
AF bandwidth @ -3dB	0.1		18	KHz	
AF output level, pin 13, pk to pk		400		mV	
LO leakage, pin 2		-57		dBm	
IF Bandwidth		200		KHz	
AFC lock range (5µV signal)		200		KHz	
TIMING					
RX select low to valid CD			1	mS	
RX select low to valid RXD			3	mS	
Transmit to Receive delay			1	mS	
RF input (5µV) to valid CD			0.5	mS	
RF input (5µV) to stable AF			0.5	mS	

PERFORMANCE CHARACTERISTICS		MIN	TYPICAL	MAX	DIMENSION	SEE NOTE
Base Band transfer function (through a pair of transceivers)						
Linear drive (4Volt pk to pk, sine)						
AF response @ -3dB		0.1		17	KHz	
Analogue distortion			5	10	%	
Digital drive						
Data rate (50:50)				40	Kb/s	4
Time between transitions		25		2000	µS	5
Average Mark:Space ratio		30	50	70	%	6
Preamble duration (10101010)		3			mS	
Data delay (TXD to RXD)			25		µS	
Interface levels - inputs						
TX & RX select,	V high	Vcc-0.5			Vcc	
	V low	0		1	V	
Source current @	V low = 0	0.5		1	mA	
TXD	V high	Vcc-0.5		Vcc	V	
	V low	0		0.5	V	
Interface levels - outputs						
RXD & CD	V high		Vcc-0.6		V	
(no load)	V low		0.2		V	

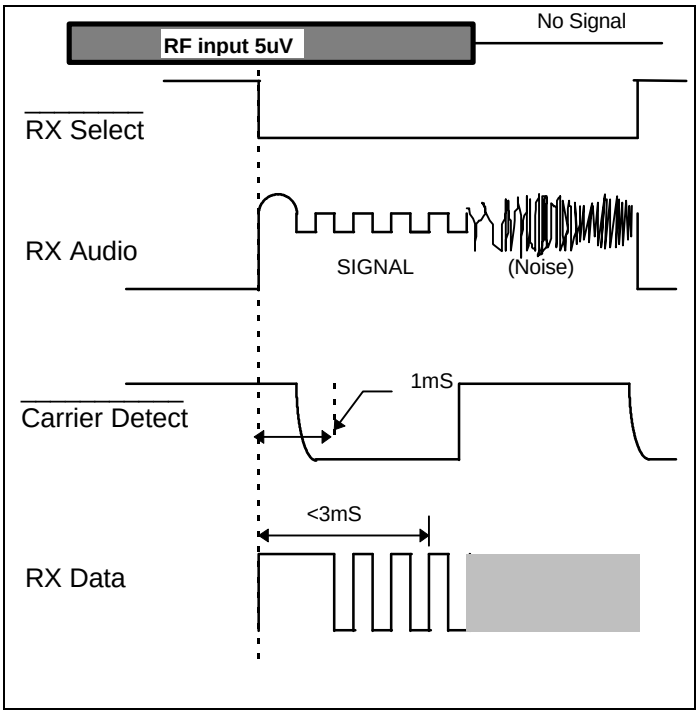
Notes:
1. Module on 50mm square ground plane , 16cm whip antenna.
2. Standard modulation : 2KHz square wave, 0 to Vcc.
3. 1KHz, 4V pk to pk, Sinewave centred on +2.5Volts at pin 14 (TXD).
4. Digital drive, 50:50 mark:space (over 4mS) data pattern.
5. High or Low pulse.
6. Averaged over any 4mS period.

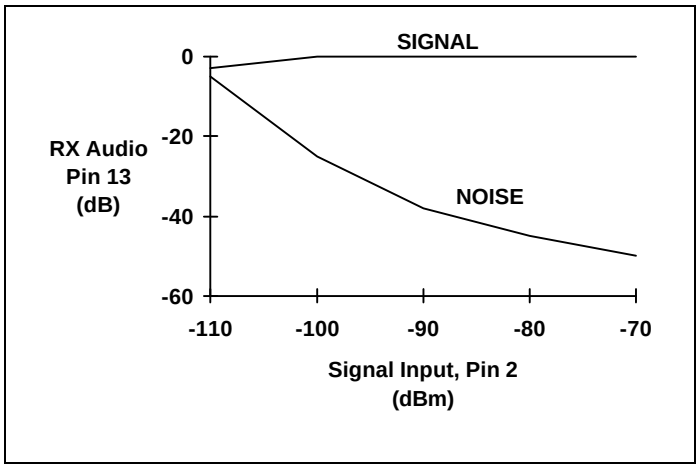
TEST CIRCUIT

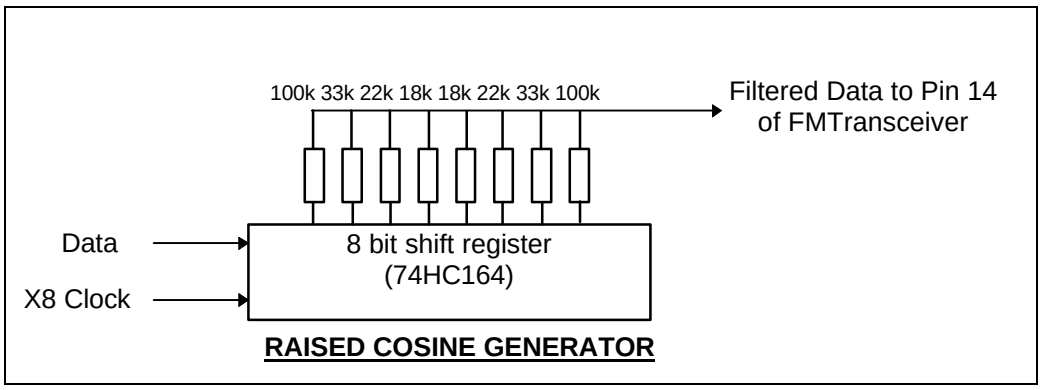


TIMING WAVEFORMS

RECEIVER SELECT TIMING







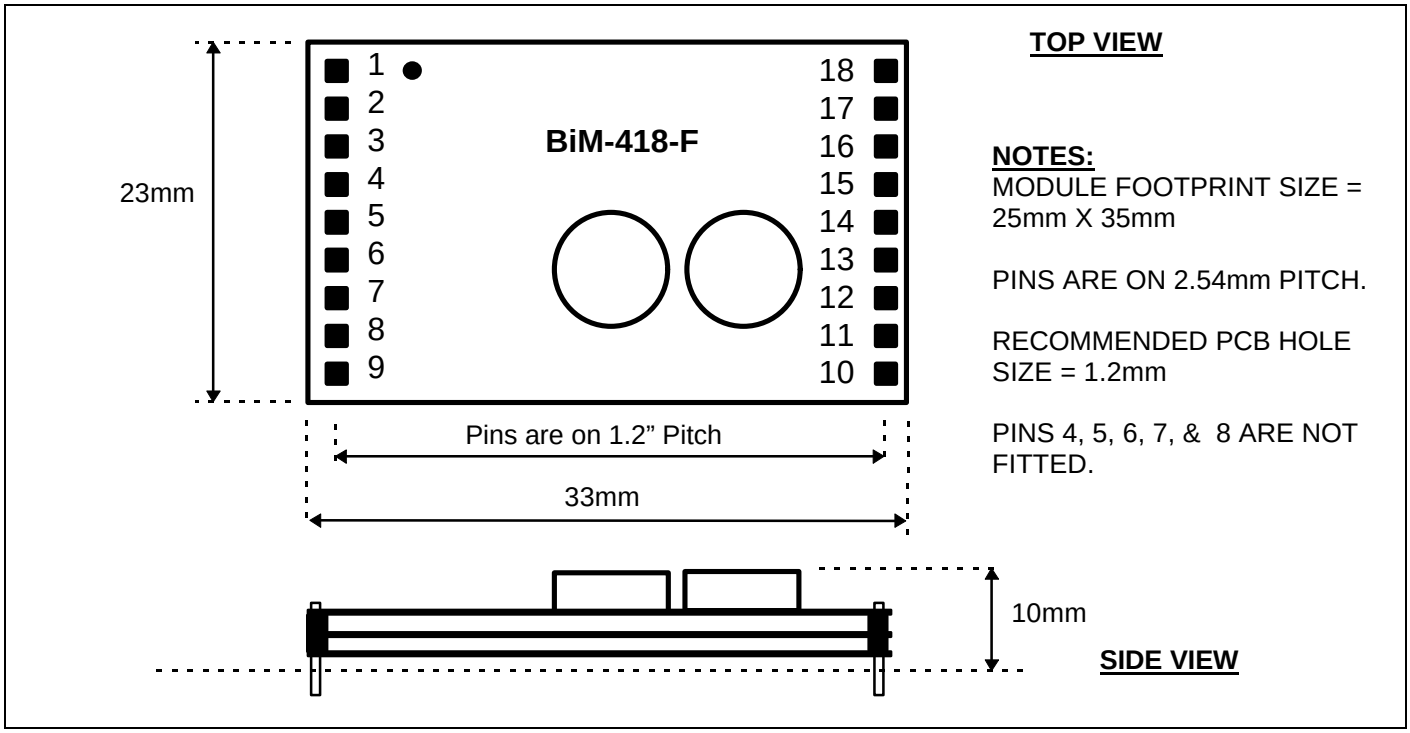
RAISED COSINE GENERATOR

ANTENNA DESIGN

The range achieved from the system is dependant on the choice and position of the antenna. The space around the antenna is as important as the antenna itself. The optimum position is to locate the antenna so that is protrudes directly out the top of the transmitter box. If this is not possible due to other design constraints, try to keep the antenna away from other metal in the system such as transformers, batteries and PCB tracks, especially ground planes. In particular, the 'HOT' end of the antenna should be kept as far away as possible from these.

For further information on Antenna design please see our full product catalogue which gives recommended applications guidance.

MECHANICAL DETAILS



TYPE APPROVAL

The BiM-418-F is type approved in the UK to MPT1340 for use in Telemetry, Telecommand and In-Building alarm applications.

ORDERING INFORMATION / DEVICES IN THE FM 418MHz RANGE		
PART No	**DESCRIPTION**	
FM-BiM-418F	Transceiver Module, Single Channel 418MHz. (0.25mW ERP)	
FM-BiM-433F	Transceiver Module, Single Channel 433MHz (10mW ERP)	
FM-BiM-EVAL	Transceiver Evaluation kit	

Should you require further assistance, please call;

R. F. Solutions,
Pannets Building, Railway Lane,
Lewes, E Sussex, BN7 2AQ.
England.

Tel +44 (0)1273 488 880. ***Fax +44 (0)1273 480 661.***

Email icepic@pavilion.co.uk

http://www.rfsolutions.co.uk

RF Solutions is a member fo the Low Power Radio Association.

RF module data appears courtesy of Radiometrix Ltd, Southall, Middlesex, England.

