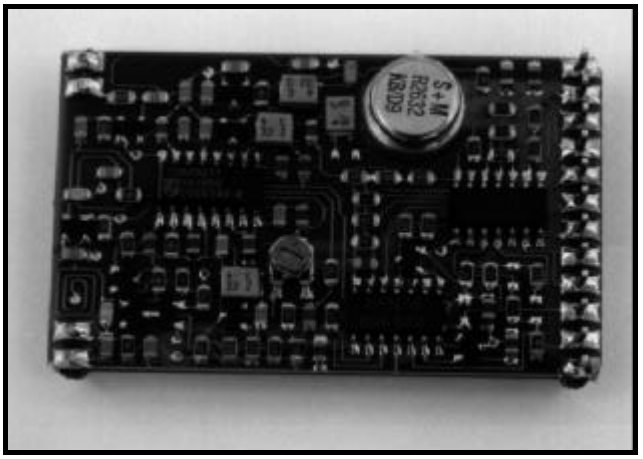
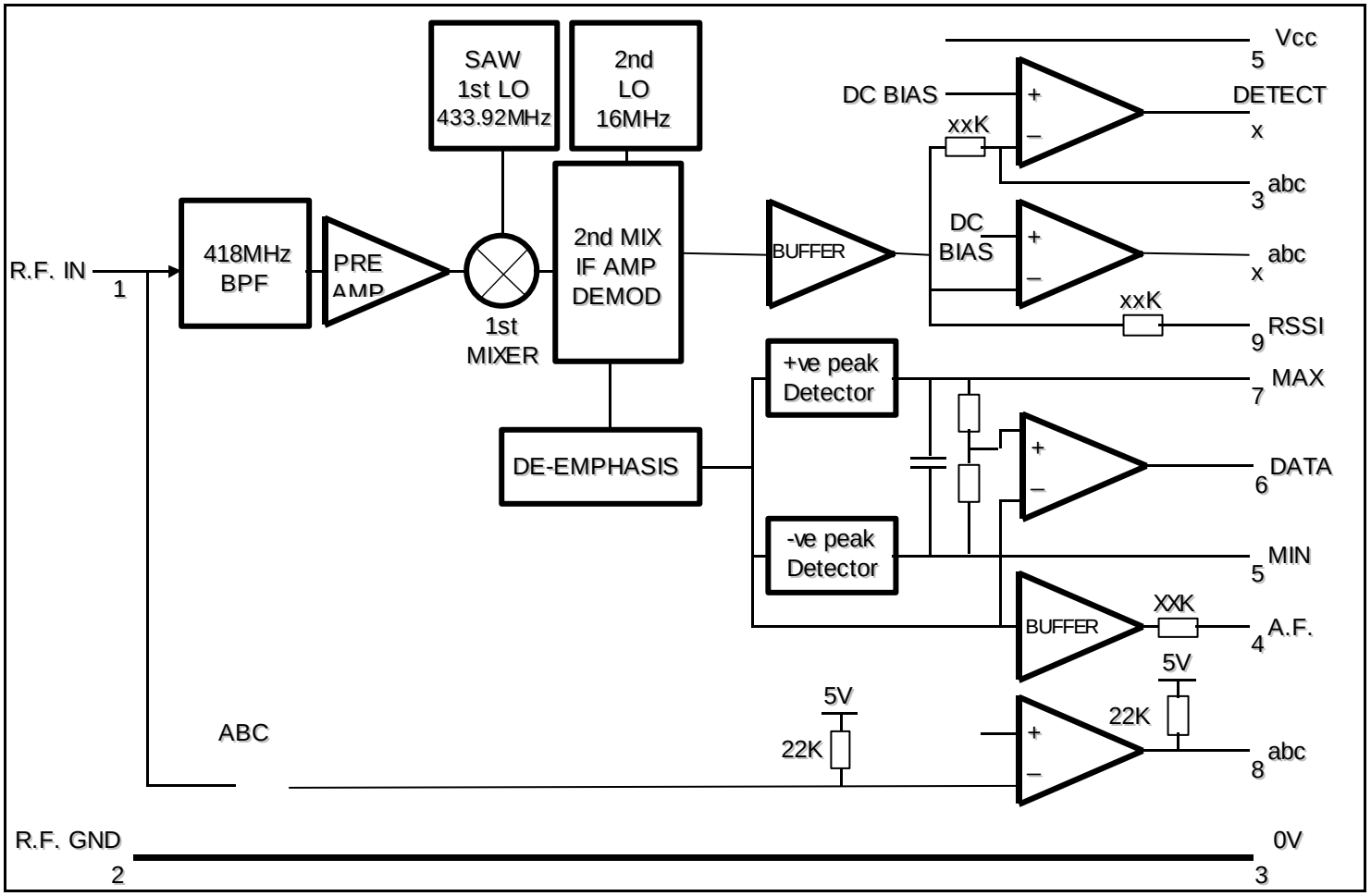
FM DIL RECEIVER MODULE. FM-RXM-418A

FEATURES



- PCB MOUNTING RECEIVER BOARD MODULE.
- SAW CONTROLLED WIDE BAND FM RECEPTION.
- HIGH DATA RATES, UP TO 10Kbps.
- SENSITIVITY TYP 0.35µV FOR 10dB S/N.
- FAST ENABLE TIME, <5mS FOR MAX POWER SAVING.
- SINGLE SUPPLY VOLTAGE (5 VOLTS).
- ANALOGUE & DIGITAL OUTPUT.
- DIRECTLY COMPATIBLE WITH R.F. SOLUTIONS FM TRANSMITTER UNITS.
- DTI APPROVED FOR USE IN THE U.K.
- RECEIVE SIGNAL STRENGTH OUTPUT.
- ANTENNA TAMPER SENSING.
- JAMMING SIGNAL DETECTOR.

BLOCK DIAGRAM



GENERAL DESCRIPTION

The R.F. Solutions FM-RXM-418A Radiometrix Receiver, is a compact PCB module which can be used to capture R.F. Data from any FM Transmitter, such as the RFS FMTX-1 (Please see RF Solutions FM Transmitter Module data sheet). When used as an FM Transmission system, up to 200m range can be achieved with a data rate of up to 10Kbps.

The simplest application of the module requires only 3 connections; +5 volt supply, ground and the data output. A simple quarter wave antenna (17cm of wire or track to pin 1) is quite adequate. A 10µF supply decoupling capacitor is recommended directly on pin 13

PIN DESCRIPTION

Pin No	Name	Description
1	R.F. IN	Connects to the Receiver antenna. Has nominal 50 Ω impedance and is capacitively isolated from internal circuit. An internally connected 22k Ω resistor is used for 'tamper' sensing on this pin.
2	R.F. GND	Should be connected to any Ground Plane, against which the antenna works. (Internally connected to pins 3, 14, 15, & 16).
3	0 VOLT	Ground for Supply.
4	AF	FM Demodulator output. It has a standing DC bias of ~Vcc/Volts, and output impedance of 330Ω.
5	Min	The voltage on this pin is the peak -ve at pin 4 (AF). A resistor between this pin and 'Max' (pin 7) controls the data slicer's transient response.
6	Data Out	CMOS compatible output from the data slicer. Is a squared version of the AF(pin 4) signal. Can be used to drive external digital decoders, it is true data. (ie. as fed to the transmitters input).
7	Max	The peak +ve voltage at 'AF' (pin 4).
8	Tamper	CMOS Compatible O/P goes low if the DC Resistance to 0V of antenna exceeds 5kΩ.
9	RSSI	Received Signal Strength Indicator. (0 to 3.3 Volts).
10	Jam	CMOS Compatible output goes low when a strong signal has been present on the receiver input for a greater time determined by a capacitor on 'Jam TC' (pin 12).
11	Detect	CMOS Compatible output goes low when an incoming signal has sufficient strength to provide a clean decodable signal on 'Data Output' (pin 6).
12	Jam TC	A capacitor between this pin and ground controls the jamming detectors delay time.
13	Vcc	Positive supply of 5Volts +/- 10%. The supply must be clean, stable (<10mV ac) and free from high frequency digital noise. A 10µF decoupling capacitor is recommended.
14 - 16	0 Volt	Ground to earth plane.

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.

DATA SLICER

A CMOS compatible data output is available on pin 6, this output is normally used to drive a digital decoder IC or a microprocessor which is performing the data decoding. The signal detect output on pin 11 may be used to gate the data output before it is supplied to a decoder, however this should only be done on systems with 'weak' digital coding i.e. where there is a danger of the decoder giving false outputs on the 'noise data' which is present on pin 6, when no valid signals are being received. Systems with good CRC, checksum or repeat code

verification will not require the 'noise data' to be gated off and as a result will be able to decode weaker signals (i.e. greater range).

The data slicer in the receive module is designed to accept data with a wide range of pulse widths and mark:space ratio's. The voltage waveform on AF (pin 4) is fed to two peak detectors, one +ve, one -ve and a comparator threshold is set half way between the max and min voltage, a small amount of hysterisis is applied. The data on pin 6 is the output of this comparator.

The data slicer has a transient response time, this is the settling/hold time of the peak detectors. It is programmable by an external resistor between pins 5 & 7 (min & max). With no resistor fitted (normal use) the data slicer settle in approx. 300mS from reception of a coded signal (i.e. the first 300mS of signal may be corrupt at the data output) and will pass pulse widths up to 50mS of continuous 1 or 0.

The addition of a resistor between pin 5 & 7 shortens these times according to the following table;

Resistor Value	Code Preamble Min Length	Longest 1 or 0 Allowed
open circuit	300mS	50mS
1MΩ	150mS	25mS
220KΩ	30mS	5mS
47KΩ	7.5mS	1.3mS

DATA DETECT

The data detect output on pin 11 is normally used for duty cycle power saving for portable equipment where power consumption must be minimised. By pulsing the receiver on/off the average supply current may often be reduced by a factor of 20 or more depending upon the system requirements, the data detect output is valid 5mS after application of the supply and is used to inhibit the power saving while data decoding is done.

JAMMING DETECTOR

Provides a logic 0 on pin 10 when a strong signal of greater than 10mV is being received. The detector may be set to give a delayed out put by connecting an electrolytic capacitor between JAM TC (pin 12) and 0v. The delay is approximately 0.7 sec/mF i.e. a 10mF capacitor will need the jamming signal to be present for 7 seconds before pin 10 goes low. The delay time will be subject to the electrolytic's tolerance so may vary widely. For accurate / long delays it is recommended that a delay of 7 seconds (10uF) be used and the Jam signal be fed to a digital timer to determine the required delay.

A.F. OUTPUT

This output is the FM demodulator's output after buffering and de-emphasis. Since it is taken before the data slicer in the module, it may be used to drive external data slicer's/demodulators in cases where the internal data slicer is not suitable. This is the case where an analogue subcarrier is being employed e.g. Two tone AFSK or DTMF tones. Here, the AF output is used to drive the FSK/DTMF decoder directly.

The AF Output is also a very useful test point to monitor for signals or interference. The output will drive low impedance headphones via a 10mF DC blocking capacitor for monitoring purpose. The phones should not be left connected during normal system operation as their low impedance will cause a certain amount of audio distortion which may upset the on board data slicer, if permanent audio monitoring is required a Hi-Z (>1KW) buffer should be used to drive the headphones.

The AF Output is DC coupled to the FM demodulator thus the DC level varies with the frequency of the incoming signal and may be used to check frequency shifts/drifts between the transmitter and receiver.

Note: the polarity of this signal is different on different frequency versions of the module, check the specific data sheet for polarity.

RSSI

Signal Strength Output. This output is also very useful for monitoring the performance of the radio link. It is a 0 to 3 volt signal which increases logarithmicaly with increasing incoming signal strength. There is an internal 6K8

resistor in series with this output so that a 0.5mA fsd meter may be connected directly for monitoring purposes. In more sophisticated systems this signal may be fed to an A/D converter to automatically monitor the integrity of the radio link.

ABSOLUTE MAXIMUM RATINGS

Supply Voltage (Vcc to GND).....-0.3 to +8Volts.
RF Input Pin 1..... 0dBm.
Any input or output Pin..... -0.3 to +Vcc, +/- 10mA.
Storage Temperature.....-40 to +100 °Celcius.
Operating Temperature..... 0 to +40 °Celcius.

TECHNICAL SPECIFICATION

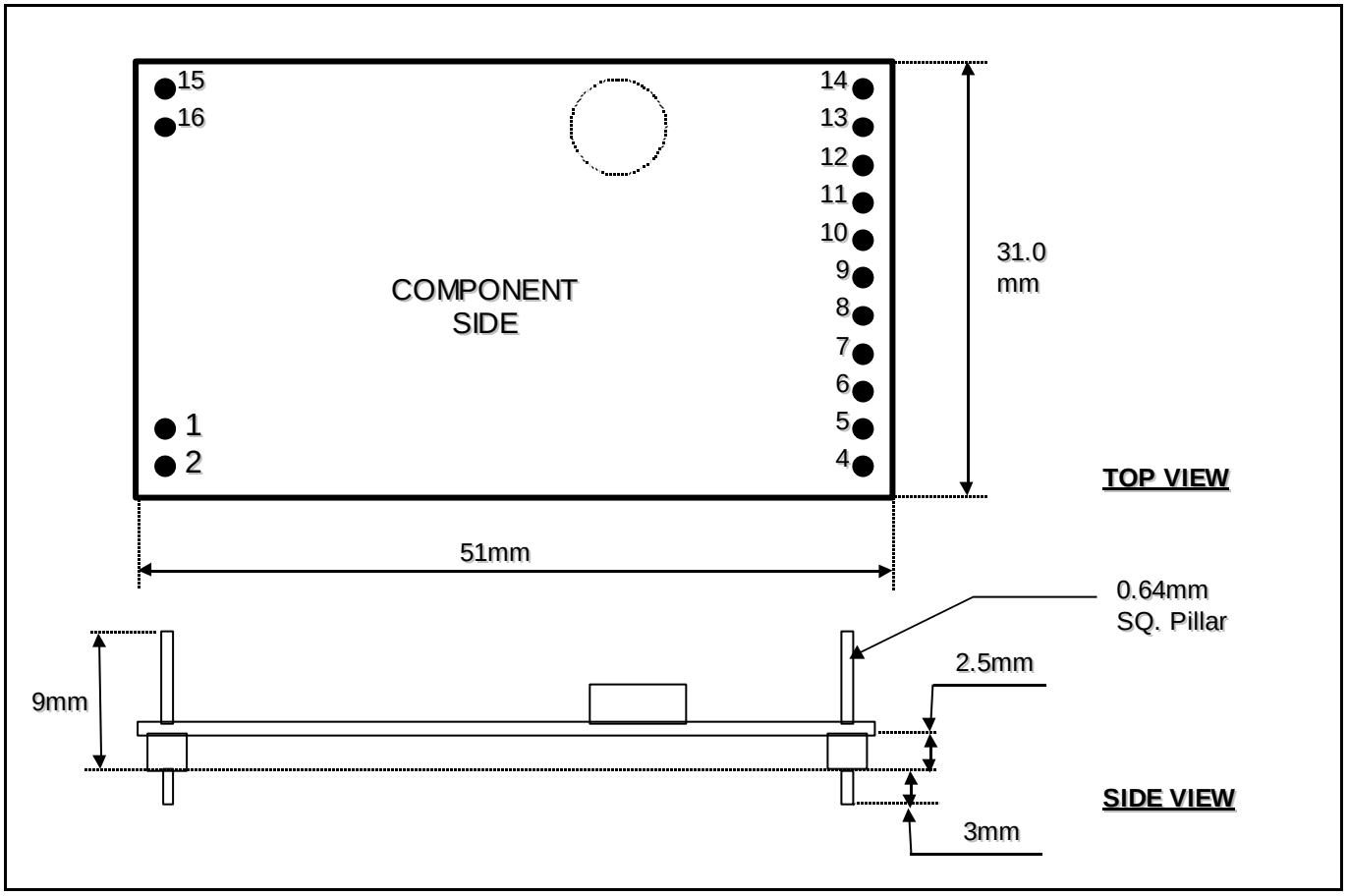
Ambient temperature = 20 °Celcius. Supply Voltage Vcc = 5.0 Volts. (Circuit as shown, "Test Circuit")

ELECTRICAL CHARACTERISTICS	PIN	MIN	TYPICAL	MAX	DIMENSION	NOTE
Supply Voltage	13	4.5	5.0	5.5	V	
Supply Current	13	17	21	27	mA	
Relative Frequency	-	-	418.0	-	MHz	
Overall Frequency Accuracy		-80	0	+80	KHz	1
Sensitivity for 10dB S/N	1	-	0.35	1.0	µV	2
Sensitivity for 20dB S/N	1	-	0.7	2.0	µV	2
Jam Detect, Threshold	1	-	10	-	µV	
Carrier Detect, Threshold	1	-	3	-	µV	
R.F. Input Impedance	1	-	50	-	Ω	
IF Bandwidth		-	250	-	KHz	3
AF Output Level	4	-	400	-	mVpp	2,3
AF Bandwidth, -3dB	4	DC		10	KHz	3
AF Bandwidth Output Impedance	4	-	330	-	Ω	
Frequency / Voltage Conversion	4	-	-8	-	mV/KHz	4
Data output;						
Logic Low	6, 8, 10, 11	0	0.2	0.5	V	5
Logic High	6, 8, 10, 11	4.5	5	5	V	6
Antenna Tamper Detector	1	0	-	5	KΩ	9
Signal Strength;						
dynamic Range	9	20	30	-	dB	
FSD	9	3.0	3.3	3.6	V	
Output Resistance	9	6.6	6.8	7.0	KΩ	
Enable Time	11	-	2	5	mS	3, 7
Signal Detect Time	11	-	1	3	mS	3,8

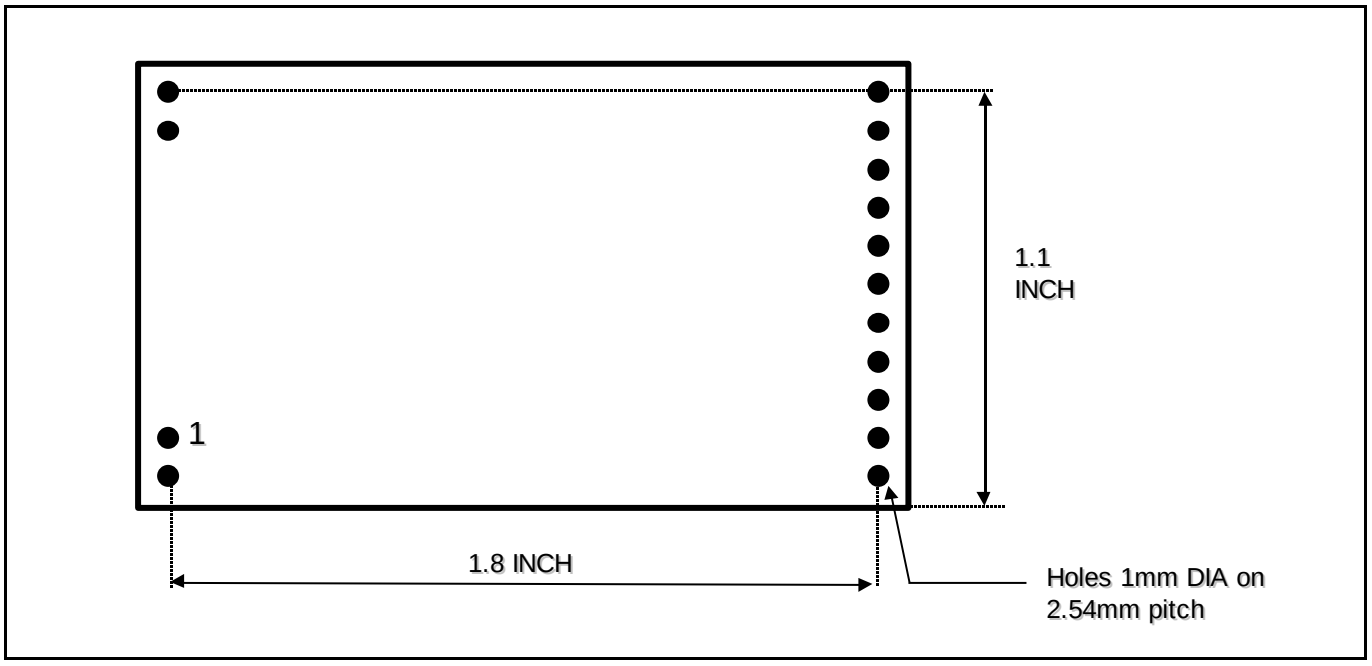
NOTES

1. Over operating temperature range.
2. + / - 25khz deviation, 2KHz tone.
3. 3µV input.
4. The conversion slope is -ve.
5. 10mA sink.
6. No load, (from 22KΩ internal pull-up).
7. From application of supply t o carrier detect low
8. From application of signal to carrier detect low.
9. For logic high on pin 8.

MECHANICAL DETAILS

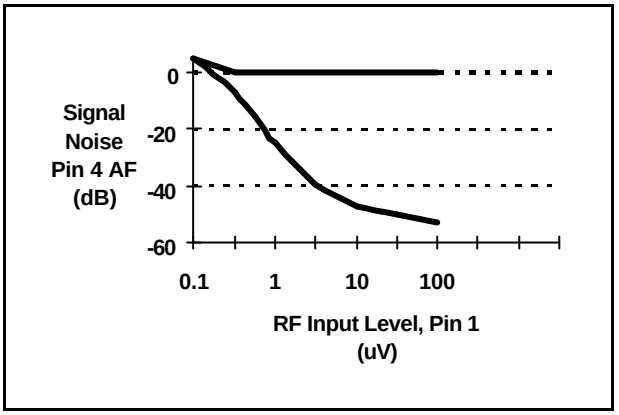


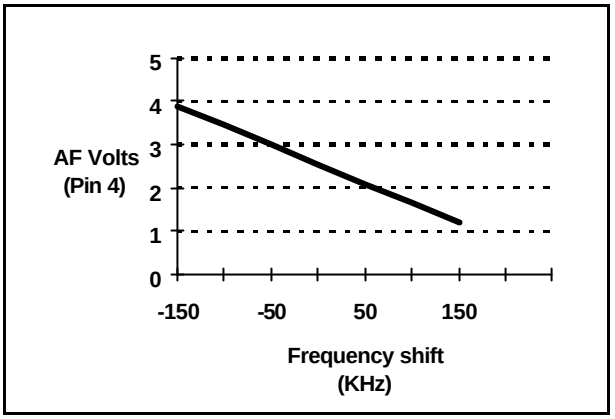
PCB MOUNTING DETAIL (TOP VIEW)

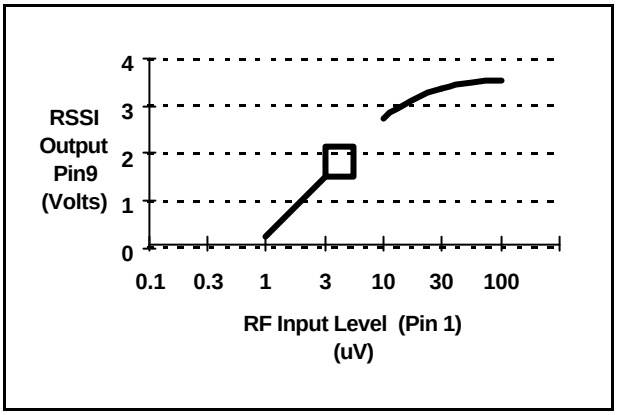


PERFORMANCE CHARACTERISTICS (Ref: Test Circuit)

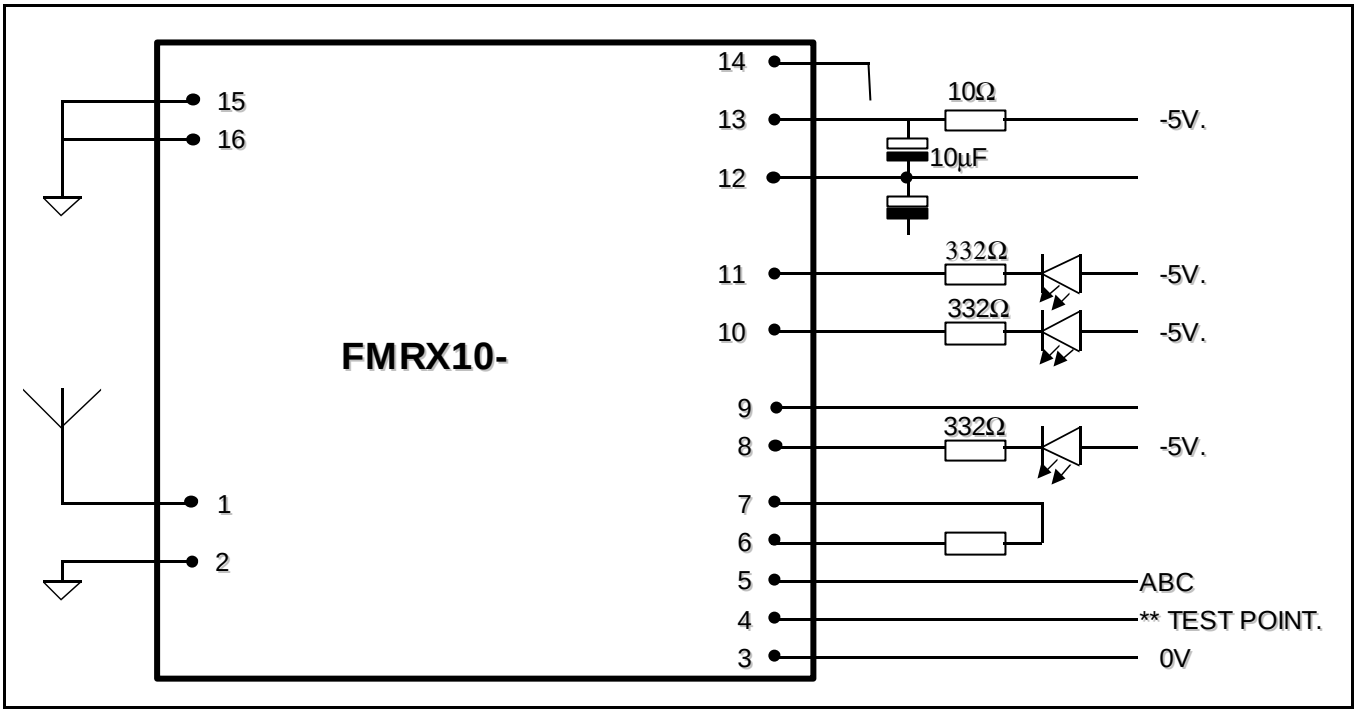
Ambient Temperature = 20 °C. Supply Voltage = +5.0Volts.
(unless otherwise stated)







TEST CIRCUIT



PART No	DESCRIPTION
FM-RXM-418A	DIL Receiver, Single Channel, 10Kbps

Should you require further assistance, please call;

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

RF Solutions is a member of the LPRA