FSK/FHSS Radio MODEM

Features

- Intelligent RF "modem in a module"
- User Selectable 868/915MHz Operation
- FM / Spread Spectrum Secure RF
- Simple TX / RX Serial interface
- CTS/RTS handshake
- Range up to 20Km
- Transmit Power 158mW (+22dBm)
- Receiver Sensitivity –148dBm
- Host data rates up to 57,600 baud
- RF Data Rates to 115Kbps
- No external components
- LED Shows Data Flow
- Secure data protocol
- Ultra low power 2.4 - 3.6V operation
- CE compliant for licence free use





Intended Use

- Remote Networking
- Cable Replacement
- Remote Data Logging
- Meter Reading

Description

GAMMA62M provides a simple "MODEM in a Module" radio link to replace a serial data cable.

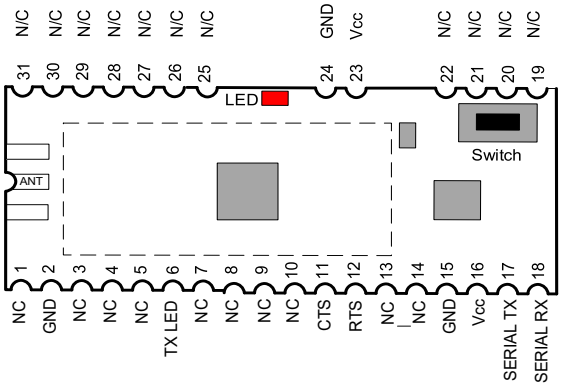
The user interface is standard low Voltage RS232, all RF operation is automatically performed internally (packetization, error checking etc).

GAMMA62 operates on the European 868 band or USA/Australia 918 band with either high speed FM or spread spectrum, Modes 1 to 7 trading operating range with Data rate.

Ordering Information

Part No	Description
GAMMA62M-89S	Radio modem module SMT package 868/915MHz
GAMMA62M-89D	Radio modem module SIL package 868/915MHz

Pin Descriptions



Pin No	Name	Direction	Description
1,3-5,7-10, 13,14, 19-22, 25-31	NC	-	Do not connect
2, 15, 24	GND	In	Connect to ground
6	LED	Out	Optional LED drive output which mirrors the on-board LED. LED operates whenever there is RF activity
11	CTS	In	Clear To Send (CTS) and Request To Send (RTS) are as RS232 standard data flow control. However they operate at the GAMMA62M module Vcc (3V).
12	RTS	Out	
17	Serial TX	Out	Host interface for data input/output. Data is transmitted and received at the low voltage level (dependent on the Vcc being used). Compatible with LCTTL / LVCMOS.
18	Serial RX	In	
16, 23	Vcc	In	Supply voltage

Default Host Interface Serial Data Format

Baud Rate: 9600 (Default)
Data Bits: 8
Parity: None
Stop Bits: 1
Flow Control: Hardware CTS / RTS

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Operation Overview

When a GAMMA62M modem receives data from its host, it automatically processes the data ready for RF transmission, (packetizes, encode, adds CRC applies preamble and addressing) then transmits the RF Data.
GAMMA62M modem has a 55 byte buffer, once full data is processed and transmitted. If the buffer is partially filled after a 10ms timeout GAMMA62M will start processing data and transmit.
A minimum of 15ms should be allowed before new data is sent to the module after each data packet.
When a GAMMA62M receives RF Data it automatically processes the data then outputs on its serial data output.

Types of Communicating

One-to-One; For point to point data communication between 2 x GAMMA62M modules.

One-to-Many/Broadcast; A network consisting a GAMMA62M acting as master and many GAMMA62M slaves (all GAMMA62M receivers have the same address).

Many-to-One; Where all transmitters with different addresses send to a single receiver address.

Note: Because each GAMMA62M modem module can be given a unique address, multiple GAMMA62M networks can co-exist in the same area. This type of operation requires clear timing between transmissions or corruption of packets can occur.

Addressing Networks

Each GAMMA62M modem module has a generic pre-configured default address (7F7F7F). This can be modified during configuration. When data received via RF it is processed and the address header embedded within it is compared with its address. Only data received with matching address will be processed and output to the host, all other data will be discarded.

When sending data, the GAMMA62M modem module has a default destination address set to 7F7F7F, this can be user configured.

By setting the two addresses appropriately the above network types can be easily achieved.

Operating Modes

Configuration Mode: In configuration mode the GAMMA62M modem module can receive commands to set internal registers to define its eventual operation. In this mode the GAMMA62M modem module is 'Offline' and cannot send or receive RF data.

Normal Operation: The GAMMA62M modem module is 'Online' automatically transmitting and receiving data from its serial interface across its RF network.

Handshaking

GAMMA62M modem module requires the handshaking RTS/CTS to communicate with its host interface.

Note: If you do not intend to use handshaking, it is possible to tie the RTS pin to GND and force the GAMMA62M to always accept data. In this configuration the GAMMA62M modem module will send all data in its buffer after a 10ms timeout. Up to 55bytes can be buffered before data is lost. A minimum of 15ms should be allowed before new data is sent to the module after each packet. This is not a recommended method of operation.

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Configuration Mode (offline)

Commands can be set using a standard terminal program or by sending the relevant ASCII characters.

Each command must be followed by the Carriage Return <CR> or 'Enter' except "+++"

Note: All commands are entered in upper case

Command	Description	Response from GAMMA62M
+++	Enter Configuration Mode Note: This command must be sent as a string with no characters in front or behind. This is to ensure that the +++ is not mistakenly received in mid-data. **(<CR> is not to be used with +++)** **Tip:** if using a "terminal" program we recommend setting +++ as a macro so that it is sent as a single packet, to ensure GAMM62 does not interpret as data to be transmitted	GAMMA62M responds with status info
?	Retrieve the current register values	GAMMA62M responds with all register values
F	Pre-configured factory defaults; R1=7F7F7F R2=7F7F7F R3 = 0 (869.4625MHz) R4 = 3 (56K) R5 = 1 (19K2) R6 = D4 R7 = 1 (Enabled) R8 = 8 (868MHz) R9 = 0 (FSK)	'OK'
H	Help	Brief description of commands available
S	Save Configuration	'SAVED'
Q	Exit configuration mode and return to online mode	No response
V	Request GAMMA62M version	Reports Hardware and Firmware Version

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Register Values (Configuration Mode)

Set a register:
To set a register, type 'R#=x' where # is the register number (1-9) and **x** is the value to set.
For example, to set the RF channel to 3 type : R3=3<CR>
(Where <CR> is carriage return or enter on the keyboard)
In the table below default values are in **bold.**

Register	Value Range	Description	Example
R1	0000 - FFFFFF (24 bit address) **Default: 7F7F7F**	Sets the recipient GAMMA62M modem module address	R1=ABCDEF (Data sent to GAMMA62M Modem module with address ABCDEF)
R2	0000 - FFFFFF (24 bit address) **Default: 7F7F7F**	Set GAMMA62M modem module address	R2=HIJKLM (Data sent is from GAMMA62M
R3	**CH0** to CH1	Sets the RF channel.	R3=2 (Transmit on channel 2)
R4	0 = 9,600 1 = 19,200 2 = 28,800 **3 = 56,000** 4 = 115,200	Set the RF baud rate* (Only applicable in FSK Mode)	R4=3 (sets the RF data rate to 56Kbps)
R5	0-FF (hex) **Default = D4**	Unique network identifier	R5=A3 Identifier set to A3.
R6	0 = 4800 **1 = 9600** 2 = 14400 3 = 19200 4 = 28800 5 = 38400 6 = 56000 7 = 57600	Host baud rate	R6=3 Baud rate set to 19K2
R7	0 or **1**	Data whitening enable	R7=1 Enable
R8	**8** or 9	8 sets Carrier to 868MHz 9 sets Carrier to 918MHz	R8=9 (set to 918MHZ carrier)
R9	**0 = FSK** 1 = LORA 1 2 = LORA 2 3 = LORA 3 4 = LORA 4 5 = LORA 5 6 = LORA 6 7 = LORA 7	Sets the transmission type. (FSK mode is not available in 918 Mode, Default is Lora 1)	R5=5 Sets transmission type to LORA 5

NOTE: When the carrier frequency is changed all registers will be reset to defaults, except the Host Baud rate.

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Using Configuration Mode

Baud rates:

It is possible to set both host and RF baud rate via configuration mode. As a general rule, the RF Baud rate should be twice the host baud rate. (this enables the data to be sent across the airwaves faster than the data sent from the host).

Unique Network identifier

Use for multiple RF networks within the same vicinity.

Adds a unique identifier at the RF stage. GAMMA62M modules with the same identifier will operate together.

Any GAMM62M with a network identifier that does not match the network identifier within the data received will ignore this incoming data, without the need to decode saving processor time and making a more efficient system. **Do not use addresses: FF, AA or 55**

RF Channel Selection

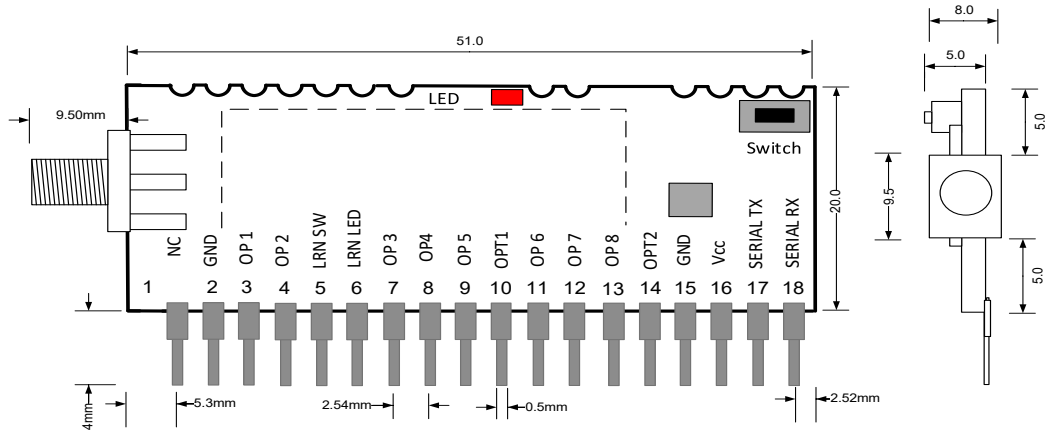
GAMMA62M can be user set to operate within the 868 or the 915 band. Within these bands several channels can be selected
868MHz is the licence exempt band within Europe and The UK.
In N.America the licence exempt band is 902-927, (typically many RF systems chose 915 as this is the mid point) . In Australia the licence exempt band is 915-927, (note that an FSK signal operating at 915 is not legal within Australia as the carrier signal will modulate below 915MHz) For this reason GAMMA62M operates at 918MHZ so that it can be used within both continents

Within the 868MHz band The EU standard sets maximum power transmission limits dependent on frequency, bandwidth and application. Please check the relevant standards are being met when implementing your Application. A rough guidance applicable to the GAMMA62M channel numbers is given below:

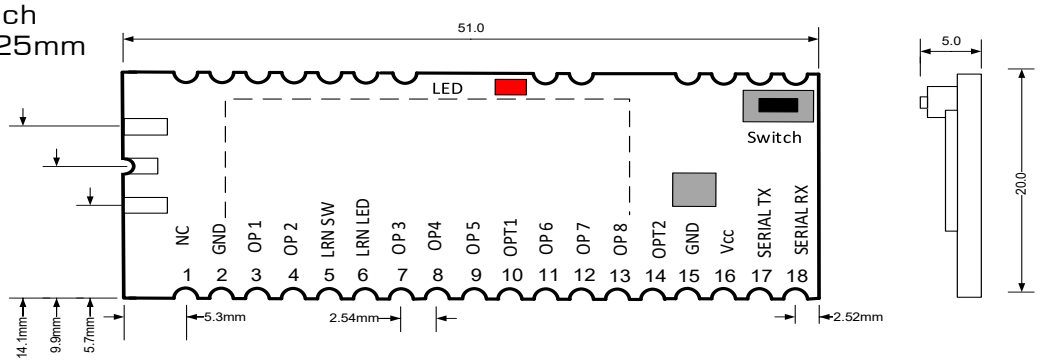
Channel Number	Frequency Centre (MHz)	USA Power Allowance mW / dBm	Frequency Centre (MHz)	EU Power Allowance mW / dBm	Notes
0	916.000	159 / 22	869.4625	159 / 22	Applicable standard EN300-220
1	917.000	159 / 22	869.5875	159 / 22	

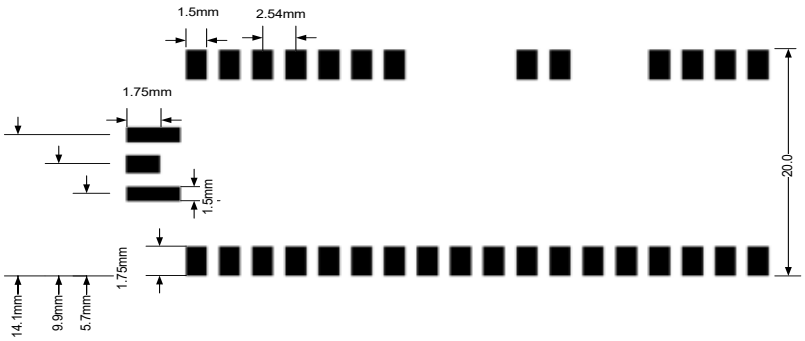
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Mechanical Dimensions



Notes
1. Pins 2.54mm pitch
2. Pin Dims 0.5x0.25mm
3. All dims in mm





Range Considerations

The antenna choice and position directly affects the system range, keep it clear of any large metal parts. The best position is protruding vertically from the top of the product. This is often not desirable for practical reasons and thus a compromise may be needed. Note that the space around the antenna is as important as the antenna itself, all radio systems are dependent on a radio signal being received through airspace.

The range quoted is the optimal in direct line of sight, without obstacles and in good atmospheric conditions.

Range is affected by many things, for example local environmental conditions, atmospheric conditions, interference from other radio transmitters.

In very worse case applications the range quoted may be reduced dramatically below the range stated.

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Technical Specifications

Absolute Maximums:

Parameter	Min	Max	Units
Voltage on any Input Vcc = 3.3v	-0.3	5.8	V
Max Input power (thro Antenna)		+10	dBm

DC Characteristics

Parameter	Min	Typical	Max	Units
Supply voltage	2.7	3.3	3.6	V
Operating Temperature	-40		+85	°C
GAMMA62M Tx supply current: When transmitting (At max power)		118		mA
GAMMA62M Rx Supply Current: When Receiving		13		mA

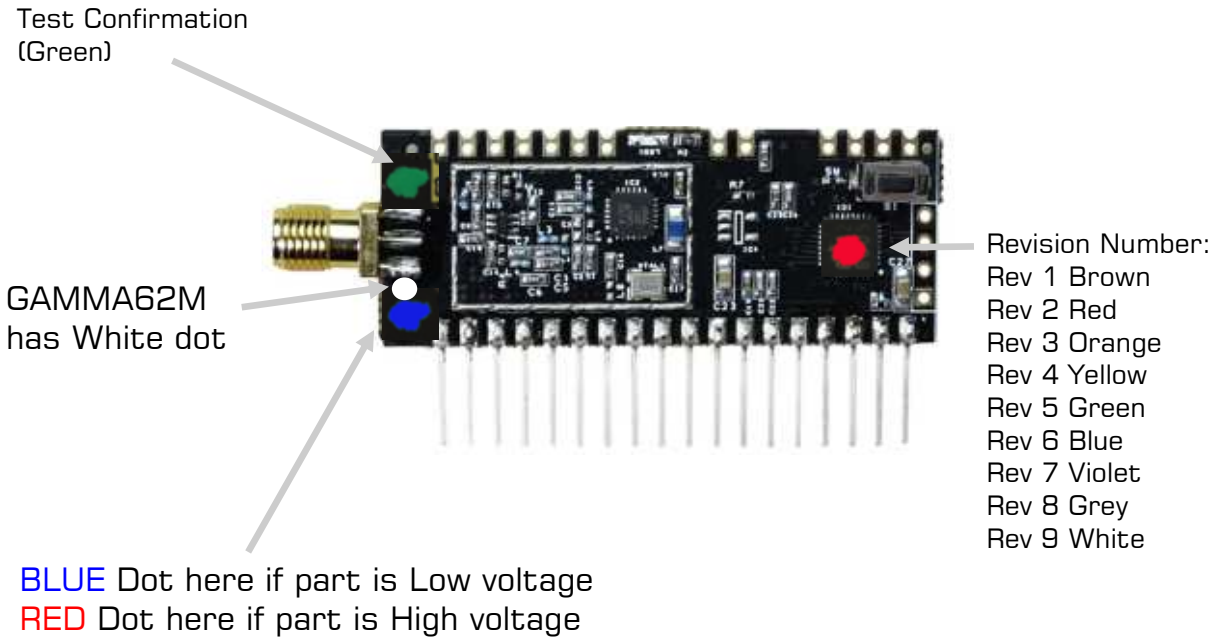
RF Characteristics

Parameter	Min	Typical	Max	Units
Operating frequency—see freq channel setting	868 915.0		870 917.0	MHz
Operating temperature	-40		+85	°C
Deviation (FSK)		45		KHz
Max Spreading Factor (FHSS)			400	KHz
Max frequency hops (FHSS)			50	Sec
GAMMA62M Tx MAX output power			+22	dBm
GAMMA62M Rx sensitivity	-121		-137	dBm

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GAMMA62M module Version Identification

On Power on the onboard LED will flash twice to indicate the module type as a MODEM module



GAMMA62M REVISION CHANGE HISTORY			
ECN	New Revision	Ident Dot	Change / Fix
	1	Brown	Initial Release

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GAMMA62M Radio Modem

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