Chipsmall Limited consists of a professional team with an average of over 10 year of expertise in the distribution of electronic components. Based in Hongkong, we have already established firm and mutual-benefit business relationships with customers from,Europe,America and south Asia,supplying obsolete and hard-to-find components to meet their specific needs.

With the principle of "Quality Parts,Customers Priority,Honest Operation,and Considerate Service",our business mainly focus on the distribution of electronic components. Line cards we deal with include Microchip,ALPS,ROHM,Xilinx,Pulse,ON,Everlight and Freescale. Main products comprise IC,Modules,Potentiometer,IC Socket,Relay,Connector.Our parts cover such applications as commercial,industrial, and automotives areas.

We are looking forward to setting up business relationship with you and hope to provide you with the best service and solution. Let us make a better world for our industry!

Contact us

Radio Modem Module

Features

- Intelligent RF modem module
- Serial data interface with handshaking
- Host data rates up to 57,600 baud
- RF data rates to 56Kbps
- **Range up to 1KM**
- Low external component requirement
- Direct LED drive shows data flow
- 5 User selectable channels
- Secure data protocol
- Ultra low power 2.4 - 3.6V operation
- CE compliant for licence free use
- 868MHz multi channel operation
- **20mW transmit power (+13dBm)**
- **Receiver sensitivity −121dBm**
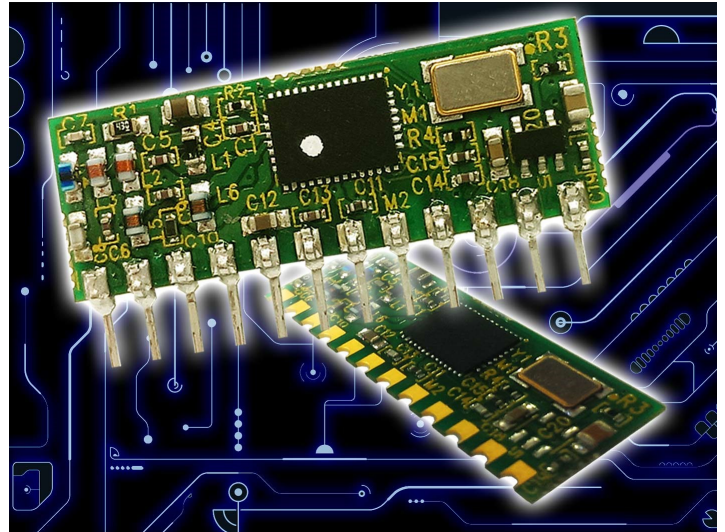
Applications

- Remote networking
- USB/RS232 cable replacement
- Remote data loggers
- Meter reading

Description

The KAPPA modem module is a highly integrated RF modem and intelligent controller with an ultra simple SIL connection footprint. The KAPPA modem module can achieve a wireless serial data link at up to 57K6bps over 1000m range. Range may be further extended with a suitable antenna.

The user interface is standard RS232, operating at low voltage. All RF operation is automatically controlled (with error checking etc) so the KAPPA can be treated as a simple communications device. Possible applications include one-to-one and multi-node wireless links used for car and building security, EPOS, inventory tracking, remote industrial process monitoring and computer networking. Because of their small size and low power requirements these modules are also ideal for use in portable, battery-powered applications such as hand-held terminals.

The KAPPA modem module is fully compatible with RF Solutions' ZULU series of modem modules.

KAPPA Modem Module

Operation Overview

The KAPPA modem module provides a simple interface to the host controller. It handles all RF data communications automatically and without any requirement from the user (RF "packetizing", preamble, encoding, CRC check etc).

With this powerful high-speed radio link, the following networks can be realised:

Networking

One-to-One; For point-to-point data communication

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

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

Note: Because each KAPPA modem module can be given a unique address, multiple KAPPA 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 KAPPA modem module has a generic pre-configured default address (7F7F7F). This can be modified during configuration. When data received via RF it is examined 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 KAPPA 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 KAPPA modem module can receive commands to set internal registers to define its eventual operation. In this mode the KAPPA modem module is 'Offline' and cannot send or receive RF data.

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

Acknowledge Secure Mode : In this mode each time a KAPPA modem module transmits an RF packet, an additional 'packet ID' is added. This ID is a rolling verification counter to receiving KAPPA modem modules.

Any correctly addressed receiving KAPPA modem module replies with an RF acknowledgment also containing the 'packet ID'. If the transmitting KAPPA fails to receive the expected acknowledgement it will transmit the packet again (up to 10 times).

Handshaking

The KAPPA modem module required the handshaking (RTS/CTS) to communicate with its host interface.
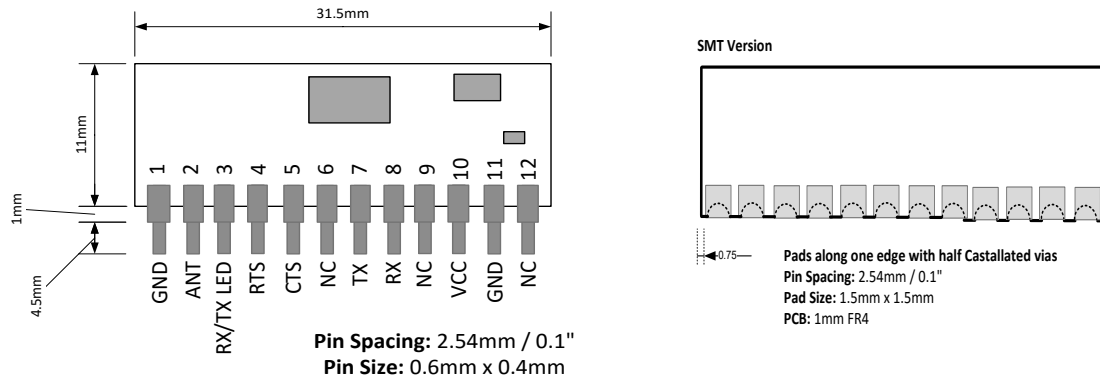
Note: If you do not intend to use handshaking, it is possible to tie the RTS pin to GND and use the modules without. In this configuration the KAPPA modem module will send all data in its buffer after a 10ms timeout. Up to 57bytes can be buffered before data is lost. A minimum of 15ms should be allowed before new data is sent to the module after each packet.

This is not a recommended method of operation.

Ordering Information

Part No	Description
KAPPA-M868	Radio modem module SIL package 868MHz
KAPPA-M868-SO	Radio modem module SMT package 868MHz

KAPPA Modem Module

Connections and Mechanical Dimensions

31.5mm

11mm

1mm

4.5mm

1 2 3 4 5 6 7 8 9 10 11 12

GND ANT RX/TX LED RTS CTS NC TX RX NC VCC GND NC

Pin Spacing: 2.54mm / 0.1"
Pin Size: 0.6mm x 0.4mm

SMT Version

0.75

Pads along one edge with half Castallated vias
Pin Spacing: 2.54mm / 0.1"
Pad Size: 1.5mm x 1.5mm
PCB: 1mm FR4

Pin Descriptions

Pin No	Name	Direction	Description
1,11	GND	-	Ground connections
2	ANT	Both	Antenna connection matched to 50ohm
3	LED	Out	TX/RX notification LED
4	RTS	In	Low level RS232 RTS
5	CTS	Out	Low level RS232 CTS
6	NC	-	Do not connect
7	TX	Out	Low level RS232 data out
8	RX	In	Low level RS232 data in
9	NC	-	Do not connect
10	VCC	IN	Vcc +2.2 - 3.6V dc
12	NC	-	Do not connect

Connections

Serial Data Format
Baud Rate: Set to 19200 as default
Data Bits: 8
Parity: None
Stop Bits: 1
Flow Control: Hardware CTS / RTS

RX, TX
These pins are for data input/output. Data is transmitted and received at the low voltage level (dependent on the Vcc being used). Compatible with LCTTL / LVCMOS.

CTS, RTS
Clear To Send (CTS) and Request To Send (RTS) are as RS232 standard data flow control used. However they operate at the KAPPA modem modules low level Vcc (3V)
If no handshaking is required, (not recommended) RTS may be pulled low. However beware of data overrun errors when transmitting streams of data longer than the data buffer size (57bytes).

Tx/Rx LED
Direct LED drive which operates whenever there is RF activity.

KAPPA Modem Module

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 KAPPA
+++	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 +++).	KAPPA responds with status info
?	Retrieve the current register values	KAPPA responds with all register values
F	Pre-configured factory defaults; R1 = 7F7F7F R2 = 7 F7F7F R3 = 02 (869.450MHz) R4 = 07 (+13dBm) R5 = 03 (56K)	'OK'
H	Help	Brief description of commands available
P	Ping Mode This sends a ping request . On receiving, the recipient KAPPA Modem will respond with its address and the level of RSSI (Received Signal Strength) The Ping command is continuously repeated every 1 second until any command or character is entered.	The originating KAPPA modem module will respond with the recipient KAPPA modems' address. eg. Received from 7F7F7F (D5) Where 7F7F7F = the recipient address D5= RSSI **RSSI** Is a hex value corresponding to the received signal strength Min = 20hex Max =E0hex
S	Save configuration	'SAVED'
Q	Exit configuration mode and return to online mode	No response

KAPPA Modem Module

Register Values (Configuration Mode)

Set a register:

To set a register, type 'R#=x' where # is the register number (1-6) 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)
Note: Defaults in BOLD

Register	Value Range	Description	Example
R1	000000 - FFFFFF (24 bit address) **Default: 7F7F7F**	Sets the recipient KAPPA modem module address	R1=000001 (Data sent to KAPPA Modem module with address
R2	000000 - FFFFFF (24 bit address) **Default: 7F7F7F**	Set KAPPA modem module address	R2=000001 (Data sent is from KAPPA modem module with ad-
R3	CH0 to CH4	Sets the RF channel selection page 7.	R3=2 (Transmit on channel 2)
R4	0 = -8dBm 1 = -5dBm 2 = -2dBm 3 = +1dBm 4 = +4dBm 5 = +7dBm 6 = +10dBm **7 = +13dBm**	Set the RF transmit power output*	R4=05 (sets transmit power to 7dBm)*
R5	0 = 9,600 1 = 19,200 2 = 28,800 **3 = 56,000**	Set the RF baud rate*	R5=03 (sets the RF data rate to 56Kbps)
R6	00 or 01	Acknowledge mode enable	R0=1 Enable
R8	0 = 4800 1 = 9600 2 = 14400 **3 = 19200** 4 = 28800 5 = 38400 6 = 56000 7 = 57600	Host baud rate	R8=03 Baud rate set to 19K2

KAPPA Modem Module

Using Configuration Mode

Baud rates:
It is possible to set both host and RF baud rate via configuration mode. The RF Baud rate should always be twice the host baud rate for best operation, however handshaking will overcome most problems.

RF Channel Selection
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 KAPPA channel numbers is given below

Channel Number	Frequency Centre (MHz)	EU Power Allowance mW / dBm	Notes
0	868.400	25 / 14	Applicable standard - EN300-220
1	868.900	25 / 14	
2	869.450	100 / 20	
3	869.600	100 / 20	
4	869.800	25 / 14	

Range
The antenna choice and position affects controls the system range. Keep the antenna clear of any large metal components in the system. The best position by far, 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. For evaluating the local environment please see our RF meter (DS006)

In the worst case, range quoted may be drastically reduced.

KAPPA Modem Module

Technical Specifications

Absolute Maximums:
Temperature Range: Storage −20 to +100ºC. Operating: Test only to 0ºC to +60ºC
Weight: 13grams

Parameter		Min	Max	Units
Voltage on any Input	Vcc > 2.2		5.8	V
	Vcc < 2.2		Vcc + 3.6	V
Max Input power (through Antenna)			+10	dBm

DC Characteristics

Parameter	Min	Typical	Max	Units
Supply voltage	2.4	3	3.6	V
Operating Temperature	-40		+85	ºC
KAPPA Tx supply current:				
When transmitting (At max power)		28	29	mA
When sleeping		-	-	-
KAPPA Rx Supply Current:				
When Receiving		16	22	mA
When sleeping		-	-	-

RF Characteristics

Parameter	Min	Typical	Max	Units
Operating frequency—see freq channel setting	868		870	MHz
Band width per channel		100		KHz
Deviation		45		KHz
KAPPA Tx MAX output power			+13	dBm
KAPPA Tx—Rx FSK Raw RF data rate	9.6		57K6	Kbps
KAPPA Rx sensitivity	-102 @57K6		-121	dBm

KAPPA Modem Module

KAPPA modem module example schematic using generic RS232 Chipset
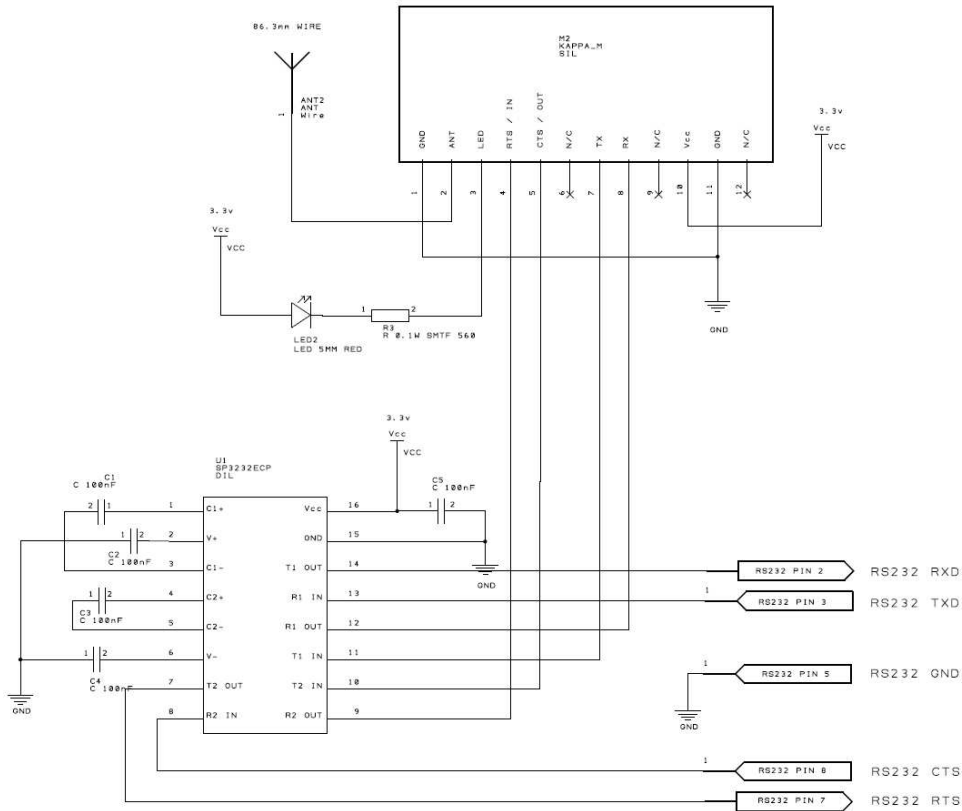
KAPPA modem module example schematic using USB - via RS232 to USB cable
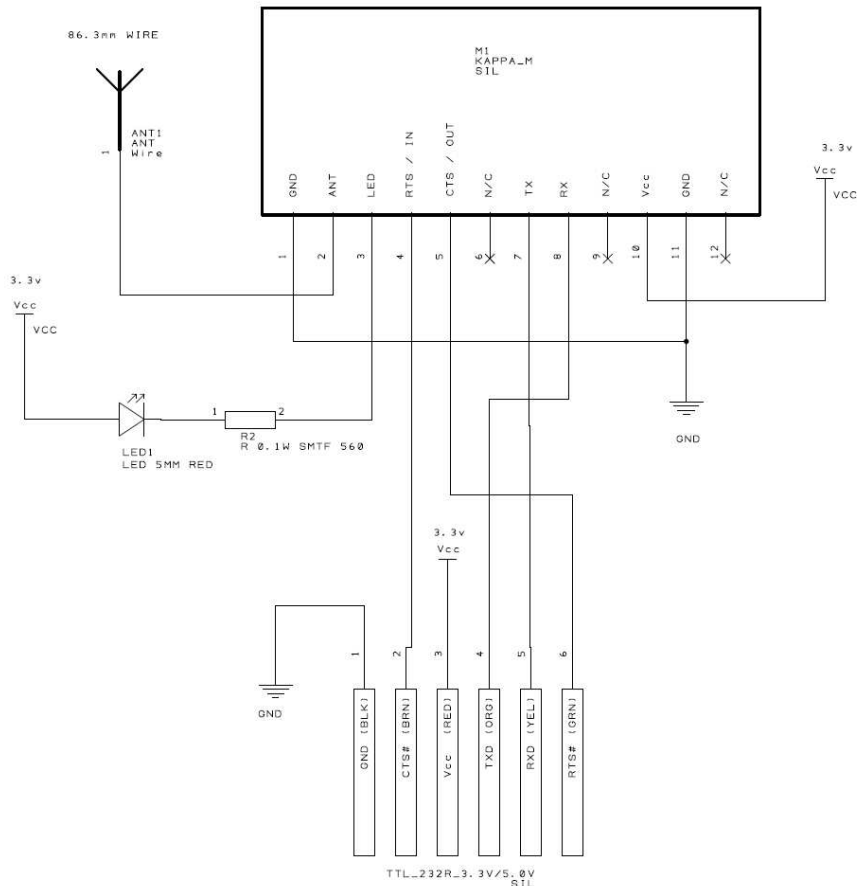
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Discard with normal waste, please recycle.

ROHS Directive 2002/95/EC
Specifies certain limits for hazardous substances.

WEEE Directive 2002/96/EC
Waste electrical & electronic equipment. This product
must be disposed of through a licensed WEEE collection
point. RF Solutions Ltd., fulfills its WEEE obligations by
membership of an approved compliance scheme.

**Waste Batteries and Accumulators
Directive 2006/66/EC**
Where batteries are fitted, before recycling the product,
the batteries must be removed and disposed of at a
licensed collection point.

Environment Agency producer registration number:
WEE/JB0104WV.

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