

[WIR-1286]868MHz LORA Wireless Module

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1) Features:

- RF centre frequency of 868MHz
- LORA direct spread spectrum modulation for higher dynamic sensitivity range
- Small 22mm x 36mmx3mm form factor. Can fit into almost anything.
- Standard UART interface with hardware flow-control (Clear-to-Send CTS)
- Easy to integrate into current devices that support RS-485, RS-232, RS-422 or 3.3V TTL serial data
- Compatible to 5V power-supply and interface
- Maximum output power of +20dBm or 100mW.
- Robust network protocol for point-to-point communication
- Node address and network address configurable
- Settable channels, baud-rate, air-data rate and RF transmit power

2) Description:

The WIR-1286 module is a low-power wireless communication solution that is ideal for Smart Grid, home automation, smart lighting, industrial sensor data acquisition and remote control applications. This module integrates LORA SX1276, an extremely low-power sub-GHz transceiver, an MCU for wireless network control and hardware interface and matching circuitry. Right out- of-the-box this module supports simple point-to-multipoint serial communication over-the-air. It has a small 22mm x 36mm form-factor for easy integration.

This module allows OEMs to easily add wireless sub-GHz capability to their electronic devices. A simple cable replacement model allows the module to be used similarly to a standard serial interface.

The WIR-1286 modules support listen-before-talk, end-to-end acknowledgement system, node addressing, network addressing and packet CRC. The destination node address is configurable to setup an acknowledgement based point-to-point communication. Without setting the destination data will be broadcasted to all nodes on the same network address.

3) PIN Configurations

Pin No.	Pin Name (left to right)	Description
1	GND	Ground
2	VCC	5.0V supply voltage
3	CTS	Clear to send output to device

4	UART-TX	Module Serial Data input
5	UART-RX	Module Serial Data output
6	PROG	Enter configure mode (active-low)

5) Module Specifications:

Hardware

Parameter	Units	Min	Typ	Max
Channel Frequency	MHz	868MHz	868MHz	868MHz
Supply Voltage	Volt	4.8V	5V	7.0V
Current (TX)	mA	45	50	80
Current (RX/idle)	mA	22	23	24
Air Data Rate	bps	128	Settable	128
RF Transmit Power	dBm	-10	Settable	+17
UART baud-rate	kbaud	9.6	Settable	115.2
VIH	Volt	2		
VIL	Volt			0.4
VOH	Volt	3	3.2	3.4
VOL	Volt	0	0.05	0.1
IO impedance	Ohm		1000	
OTA Range*	Meter		1km	2km

*Note – Range measurement made at max power of +20dBm, line-of-sight, 10m from ground with 20% Packet Error Rate (PER)

LED Indications

There are two LEDs for user feedback on each WIR-1286 modules.

- The RED led depicts the status of the module. It will blink every 2 sec when powered up and active.
- The GREEN led depicts whether the module is performing a packet transmission or reception process.

Warnings

- The maximum allowable voltage on any of the interface pins with respect to GND is 3.6V
- The maximum input voltage VCC with respect to GND is 7V
- The baud rate setting in configure mode is fixed 9600bps
- Do not leave the UART_TX input pin of the module open. The module will send junk data on the wireless channel. It must be pulled up to VCC if not used.

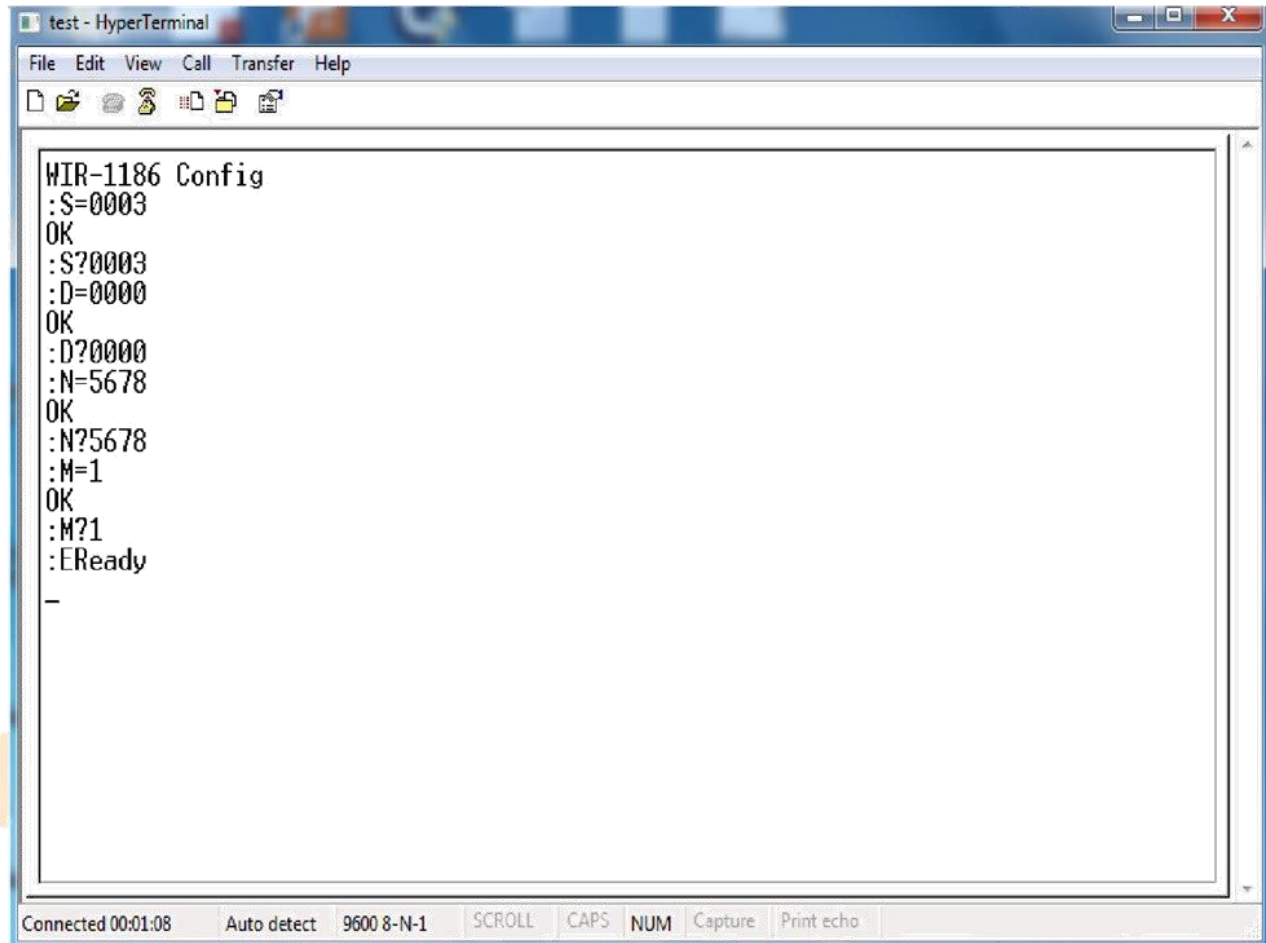
6) Usage Steps for simple wireless serial link:

- Connect the RXD line TXD line of the module to each other for null- modem setup or to Data terminal
- Connect a stable and regulated power supply to the GND and Vin pins

- Notice that the on board RED LED will blink every 2 sec. This means that the module is operating and actively in reception mode to receive any wireless data.
- Connect another module in the similar fashion as described in steps 1 to 3.
- Transmit UART data with baud rate of 115200bps on the TXD line (pin 4.) of the module
- The GREEN led will blink to show that it received the data
- The module at the other end will also blink its GREEN LED to indicate that it is received the data wirelessly
- Data will be received on the UART RXD (Pin 5.) pin of the other module

Enabling Point-to-Point and Data Hopping

- Enter configuration mode by pulling-down the PROG pin
- The module will send “WIR-1286 Config” on its UART output
- Use the command list below to configure the modules parameters
- The “S” command can be used to read and write the 16-bit address of the node. Note that this should be unique within the network for true point to point communication
- The “D” command is used to enable Point-to-Point communication and to set the address of the destination node. Now data will only be received by a node with this address.



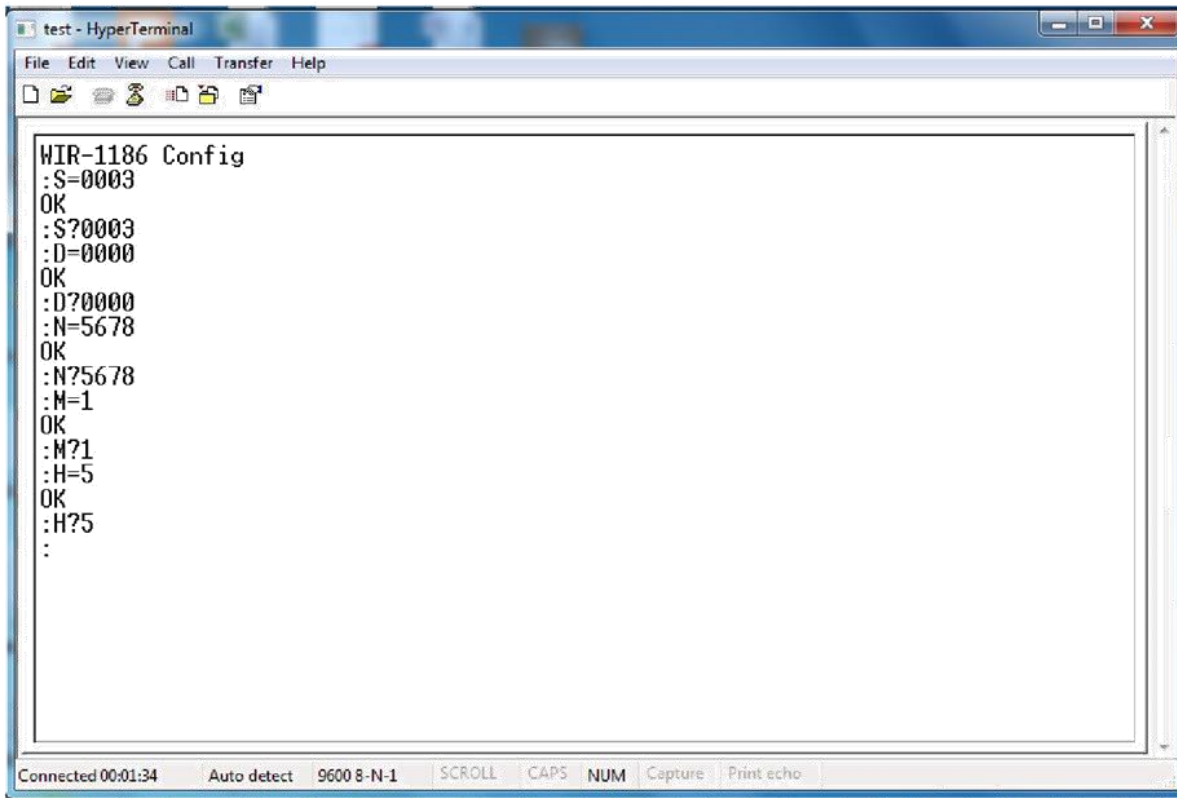
The screenshot shows a HyperTerminal window titled 'test - HyperTerminal'. The window contains the following text:

```
WIR-1186 Config
:S=0003
OK
:S?0003
:D=0000
OK
:D?0000
:N=5678
OK
:N?5678
:M=1
OK
:M?1
:EReady
-
```

The status bar at the bottom of the window indicates 'Connected 00:01:08', 'Auto detect', '9600 8-N-1', 'SCROLL', 'CAPS', 'NUM', 'Capture', and 'Print echo'.

Entering Configuration Mode:

Configuration mode can be entered by pulling-down the PROG (pin 6.) to GND. See an example of operating in configuration mode.



```
test - HyperTerminal
File Edit View Call Transfer Help
WIR-1186 Config
:S=0003
OK
:S?0003
:D=0000
OK
:D?0000
:N=5678
OK
:N?5678
:M=1
OK
:M?1
:H=5
OK
:H?5
:
Connected 00:01:34 Auto detect 9600 8-N-1 SCROLL CAPS NUM Capture Print echo
```

Setting of each parameter can be read using their command character followed by a “?” and a carriage return. A new setting value can be written by using the “=” character instead of the “?” character followed by the value to be written and a carriage return. The “E” command followed by a carriage return is used to exit out of config mode.

7) Command List and Parameter Setting (version 1.4, Nov 2014)

This command list is applicable only in Configuration Mode. Once in Configuration mode the normal functions of the module are suspended. It will no longer be able to receive or send packets. The configuration values of these parameters are stored in a non-volatile memory on board the module. It is not required to set the parameters on a regular basis except for the destination node address which should be written before any point-to-point communication is required.

Parameter	Command Char	Value Range	Parameter Min	Default	Parameter Max	Memory Storage
Air Data Rate	"A"	XX*				EEPROM
UART Baud Rate	"B"	XX*	9.6kbaud	9.6kbaud	115.2kbaud	EEPROM
RF Channel Frequency	"C"	XX*	868MHz	868MHz	868MHz	EEPROM
Destination ID	"D"	XXXX*	0000	0000	FFFF	RAM
Exit Command Mode	"X"	None	None	None	None	RAM
Network ID	"N"	XXXX*	0000	00000000	FFFFFFFF	EEPROM
RF TX Power Level	"P"	XX*	-24dBm	+20dBm	+20dBm	EEPROM
Hardware ID	"S"	XXXX*	0000	0000	FFFF	EEPROM
Verbose Mode	"V"	0-1	0	0	1	EEPROM
Deep Sleep	"Z"	None	None	None	None	RAM

*Representation of Hexadecimal Nos. (For 8bit, 32bit and 128-bit data types in command mode):

Representation of Hexadecimal Numbers:

Destination ID, Network ID and Hardware ID are 16-bit numbers displayed in hexadecimal representation. This means that the hexadecimal number is converted to ASCII before printed on a terminal. Similarly, when a value is entered in an ASCII format it is converted to hexadecimal and stored as a 16-bit number. For Example:

If Hardware ID is 0x01AA, when the "S?\r\n" string is sent to the module, at 115200bps in command mode, it will display 01AA on a terminal screen. This would be four bytes sent and in decimal it would read as below. These are the ASCII values for these characters.

Byte1: 48
 Byte2: 49
 Byte3: 65
 Byte4: 65

While writing the Destination ID to 0x01BB the string: "D=01BB\r\n" must be sent to the module in command mode at 115200bps.

Air Data Rate

Value Stored	Setting
0	1024 chips/symbol
1	2048 chips/symbol
2	4096 chips/symbol

UART Baud Rate

Value Stored	Setting
0	9.6kbaud
1	19.2kbaud
2	38.4kbaud
3	57.6kbaud
4	115.2kbaud

Carrier Frequency

Value Stored	Setting
0	868MHz
3	868.5MHz
6	868MHz
9	868.5MHz
24d or 0x18	868MHz

RF Transmit Power Level

Value Stored	Setting
0	+20dBm
1	+10dBm
2	+4dBm
3	-2dBm
4	-8dBm
5	-14dBm
6	-20dBm
7	-24dBm

Signal Strength Mode

Value Stored	Setting
0	Disabled
1	Enabled Signal Strength Display

*Note-This mode should not be used during data transfer. It is only used to check the route formation and healing process and to debug any problems with the network

8) Range

The WIR-1286 module and design have been tested for half duplex communication and reliability in multiple indoor and outdoor settings. Indoor settings and settings involving construction, concrete and metal can vary the results considerably.

- Open Field Range @ 1m from ground: ~1000meters
- Open Field Range @ 10m from ground: ~2000meters
- Open Field Range @ 30m from ground: ~5000meters

9) Flow Control

The WIR-1286 offers data flow control hardware to allow for zero data over-run and loss when sending large files and data packets. The internal data buffer on the WIR-1286 module is 128bytes. When the data terminal sends a large file for wireless transmission the module will except 128bytes and then set the CTS pin LOW to alert the data terminal to wait for the CTS to back HIGH before sending more data over UART.

11) Exiting Command mode and Sleep Mode

“X” command will exit command mode without resetting the transceiver and MCU, so all RAM variables in transceiver variables are intact. “E” command will hard reset the MCU and transceiver. All transceiver registers and RAM registers will be reinitialized on start-up. “Z” command is deep power down. Transceiver is put in Shutdown and MCU is in lowest power level. Toggle the PROG pin to exit this power down mode. MCU will reset after power down

Service and Support

Service and support for this product are available from Robokits India. The Robokits Web site (<http://www.robokits.co.in>) maintains current contact information for all Robokits products.

Limitations and Warrantees

The **LORA 868MHz Wireless serial link[WIR-1286]** is intended for personal experimental and amusement use and in no case should be used where the health or safety of persons may depend on its proper operation. Robokits provides no warrantee of suitability or performance for any purpose for the product. Use of the product software and or hardware is with the understanding that any outcome whatsoever is at the users own risk. Robokits sole guarantee is that the software and hardware perform in compliance with this document at the time it was shipped to the best of our ability given reasonable care in manufacture and testing. All products are tested for their best performance before shipping, and no warranty or guarantee is provided on any of them. Of course the support is available on all of them for no cost.

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