

LR70 Datasheet

Amp'ed RF Technology, Inc.

LR70 Product Specification



Description

The LR70 module with LoRa and BLE capabilities, supports long range Mesh networks, from a surface mount PCB module.

This module integrates MCU, BLE, and LoRa into a single module, with simple to use AT command interface. Mesh networking data is sent over a network of long range bearers (LoRa) and connect to a proxy device such as PC, tablet, or mobile phone.

Customized firmware for peripheral device interaction, power optimization, security, and other proprietary features may be supported and can be ordered pre-loaded and configured.

Software

BLE Stack

- Bluetooth v5.1 BLE
- ATT/GATT LE layers
- BLE Mesh, Relay, Proxy, and Friend nodes.
- Authentication and encryption

LoRa Software

- Mesh over LoRa media bearer
- LoRa protocol stack

General Features

- On module LoRa Protocol Stack
- Bluetooth v5.1
- Range 8 km
- FCC/IC/CE & Bluetooth qualified

RF Features

- Long range transceiver, 866Mhz or 915Mhz bands
- Bluetooth 2.4Ghz transceiver
- RX sensitivity: -146 dBm
- TX power: 28 dBm
- FSK/GFSK LoRa modulations: 0.3 to 37.5 kbps

MCU Features

- 1M bytes RAM, 2M byte Flash memory
- UART/I2S/I2C/SPI
- 8 GPIO
- Analog ADC and DAC audio

Firmware Features

- LoRa and Bluetooth Low Energy protocols
- Mesh support for both LoRa and BLE networks (LoRa Mesh)
- Firmware upgrade over UART

Applications

- Remote metering
- Building automation
- Smart city
- Internet of Things (IoT)

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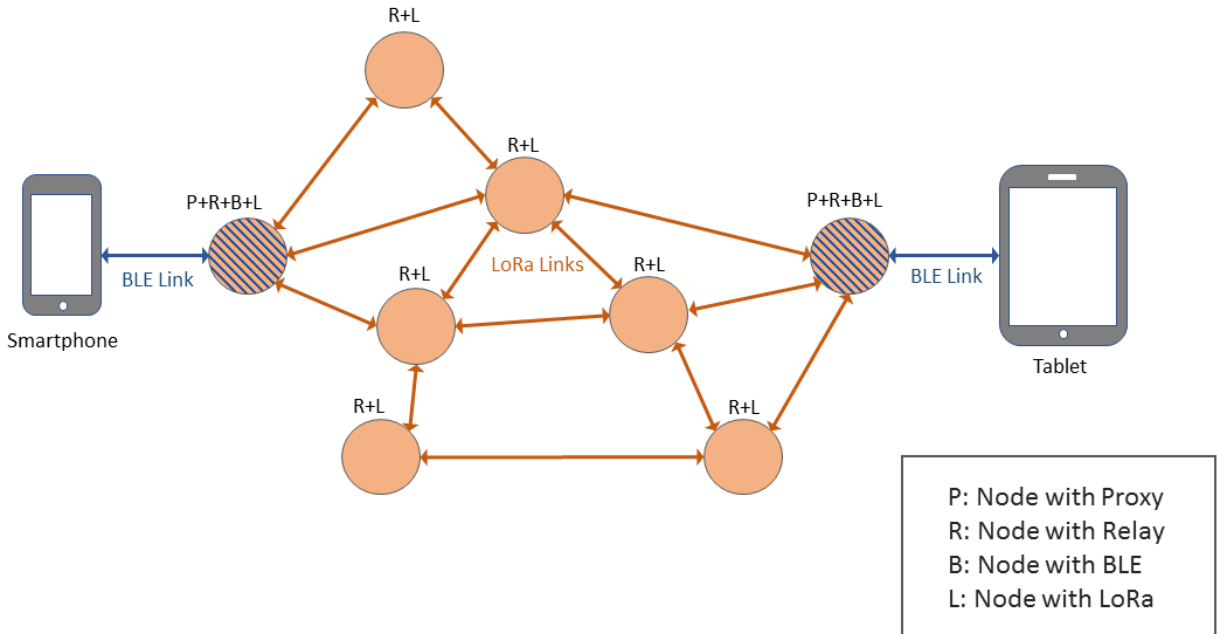
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1. Mesh Network

Software Architecture

AT Serial Command Set	
Mesh	LE Profiles & Mesh
LoRa Protocol Stack	ATT/GATT LE
LoRa Radio	Bluetooth Radio
GPIO/Serial/Audio/Flash	

Mesh Example



- Proxy Nodes communicate over BLE to standard BLE enabled devices
- Relay Nodes utilize LoRa connectivity to send data over long distances

2. Hardware Specifications

General Conditions (V_{IN} = 3.3V and 25°C)

2.1. Recommended Operating Conditions

Rating	Min	Typical	Max	Unit
Operating Temperature Range	-40	-	85	°C
Supply Voltage V_{IN}	2.8	3.3	5.5	Volts
Supply Voltage $V_{DD PA}$	3.3	5.0	5.5	
Signal Pin Voltage	-	$0.7V_{DDIO} \sim V_{DDIO}$	-	Volts
RF Frequency, BLE	2400	-	2483.5	MHz
RF Frequency, LoRA	780		960	MHz

2.2. Absolute Maximum Ratings

Rating	Min	Typical	Max	Unit
Storage temperature range	-55	-	+150	°C
Supply voltage V_{IN}	-0.3	-	+5.0	Volts
I/O pin voltage V_{IO}	-0.3	-	+5.5	Volts
RF input power	-	-	0	dBm

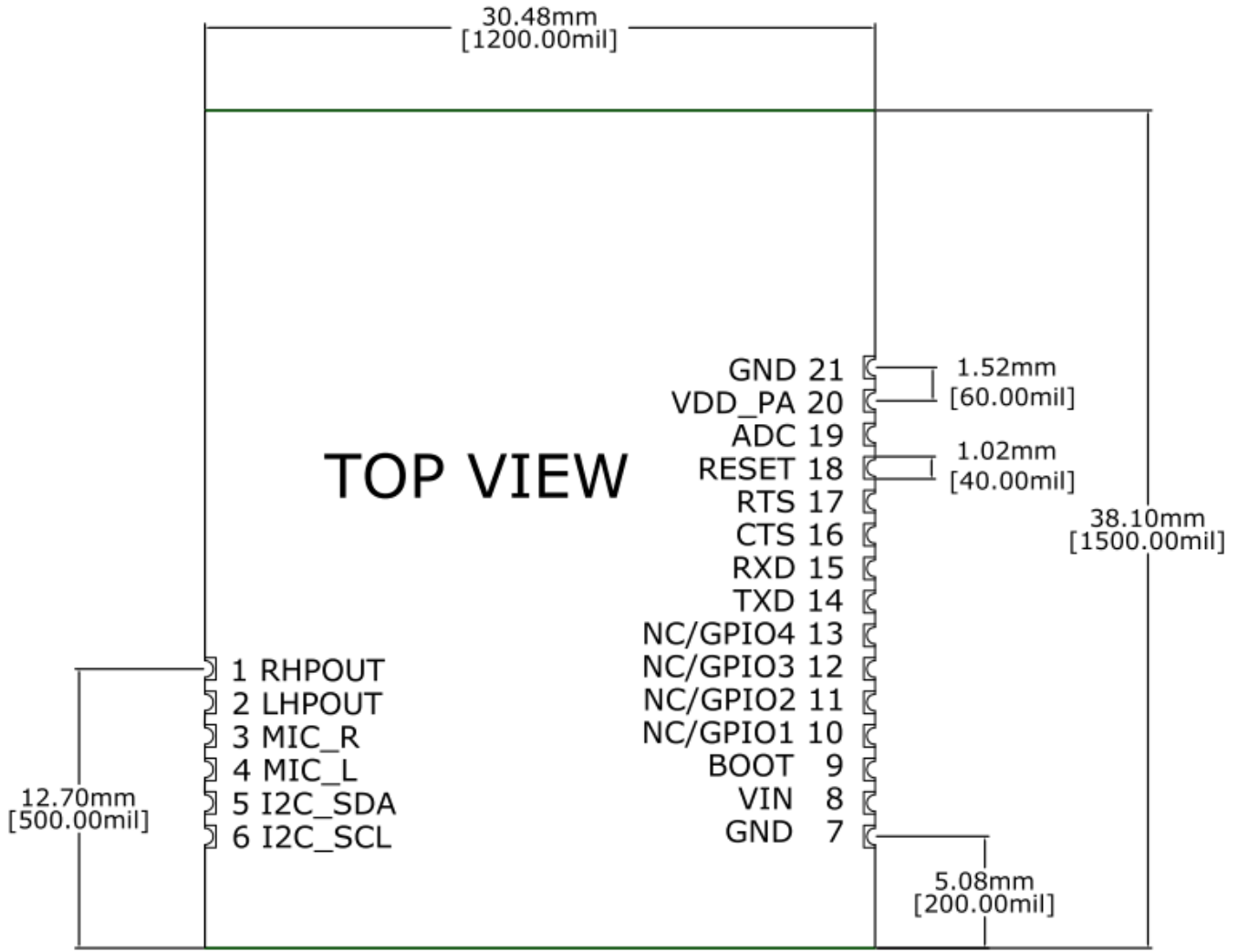
2.3. Current Consumption

Modes (Typical Power Consumption)	Avg	Unit
LoRA repeater operation		
Deep sleep mode		uA
Sleep mode		uA
Idle mode		mA
Rx mode		mA
Tx mode		mA

2.4. Pin Assignment

Name	Type	Pin #	Description
UART Interface			
TXD	O	14	Transmit data
RXD	I	15	Receive data
CTS	I	16	Clear to send (active low)
RTS	O	17	Request to send (active low)
Power and Ground			
VIN		8	Voltage supply
VDD_PA		20	Voltage supply PA
GND		7	GND
GND		21	GND
Reset			
RESETN	I	18	Reset input
Fast boot			
BOOT	I	9	Boot mode
GPIO			
I2C_SDA	I/O	5	I2C data
I2C_SCL	I/O	6	I2C clock
GPIO1	I/O	10	General purpose
GPIO2	I/O	11	General purpose
GPIO3	I/O	12	General purpose
GPIO4	I/O	13	General purpose
ADC	I	19	Analog to digital
Audio			
RHPOUT	O	1	Headphone out right
LHPOUT	O	2	Headphone out left
MIC_R	I	3	Mic in right
MIC_L	I	4	Mic in left

2.5. Layout Drawing



38.1 mm x 30.5 mm x 3.2 mm (+/- 0.4mm, height tolerance)

3. Hardware Design

Notes

- All unused pins should be left floating; do not ground.
- All GND pins must be well grounded.
- The area around the antenna should be free of any ground planes, power planes, trace routings, or metal for at least 5 mm in all directions.
- Traces should not be routed underneath the module.

3.1. Module Reflow Installation

The LR70 is a surface mount connectivity module supplied on a 23 pin, 4-layer PCB. The final assembly recommended reflow profiles are:

For RoHS/Pb-free applications, Sn96.5/Ag3.0/Cu0.5 solder is recommended.

- Maximum peak temperature of 230° - 240°C (below 250°C).
- Maximum rise and fall slope after liquidous of < 2°C/second.
- Maximum rise and fall slope after liquidous of < 3°C/second.
- Maximum time at liquidous of 40 – 80 seconds.

3.2. GPIO Interface

All GPIOs are capable of sinking and sourcing 6mA of I/O current.

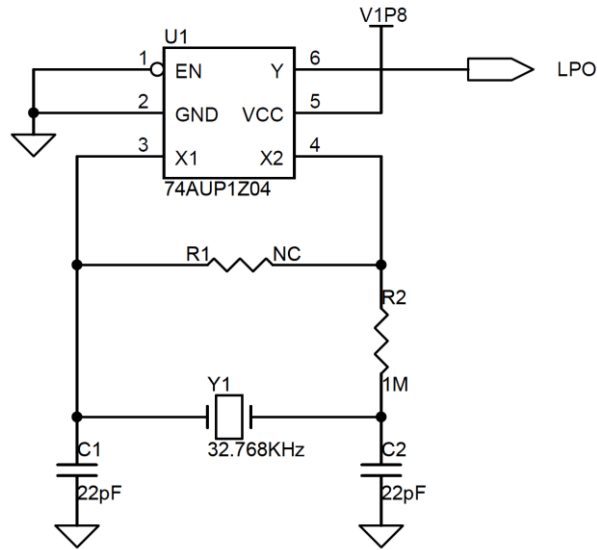
3.3. PCB Layout Guidelines

TBD

3.4. External LPO Input Circuit

An external source may optionally supply the slow clock to the LPO pin. The source must be a digital signal 1.2 to 1.8V. The accuracy of the slow clock frequency must be 32.768 KHz \pm 100 ppm.

3.4.1. External LPO circuit example



External LPO Reference Circuit

3.5. Application Reference Design

TBD

4. Ordering Information

Part Name	Description
LR70-P9	Long Range Mesh module proxy with BLE and LoRA connectivity. 915 Mhz LoRA band.
LR70-R9	Long Range Mesh module repeater with LoRA connectivity. 915 Mhz LoRA band.

5. Revision History

Date	Revision	Description
20, Dec 2022	1.0	Initial version
12, April 2023	1.1	