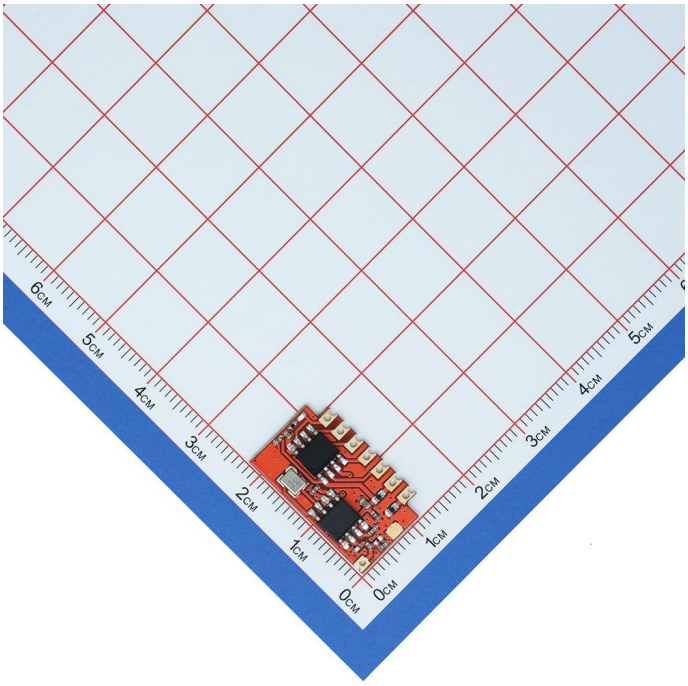
Ling-R1pro Receiver Module Datasheet



Item	Details
Product Model	Ling-R1PRO
Document Version	V2.5
Release Date	2026-07-04
Brand	FNRF

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1 Product Overview

Ling-R1PRO is an ASK/OOK remote-control receiver module for 433.92 MHz remote-control reception. It integrates decoding logic, automatically recognizes common encoding schemes such as 1527, and can learn common RF remote controls.

Ling-R1PRO provides either four switching outputs or one serial-output mode; specify the required output mode when ordering. It is suitable for remote-control receiver applications including lighting switches, wireless doorbells, smart homes, rolling-shutter doors, remote-control toys, and security alarms.

The module is a receiver version designed for motor-interference resistance and can be used with transmitters such as Ling-T1, Ling-T3, and Ling-T3MAX. Actual receiving distance and stability depend on transmitter power, antenna, power supply, enclosure, installation position, motor/relay interference, and the on-site co-channel environment; verify in the final product structure.

2 Key Features

- 433.92 MHz options.
- ASK/OOK reception for common remote-control encodings.
- Automatically recognizes common encoding schemes such as 1527.
- Wide-range decoding with automatic adaptation to conventional pulse widths.
- Supports M1 toggle, M3 momentary, M4 interlock, and M5/M5N serial-output modes; specify when ordering.
- Learns up to 80 remote controls; retained without power.
- On-board LED status indicator.
- Supports one-key emergency output shutoff.
- Serial versions use fixed 9600 bps ASCII plain-text decoded output.

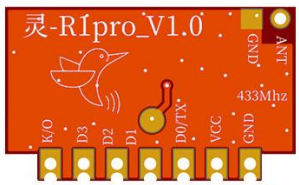
3 Typical Applications

- Lighting switches
- Smart homes
- Rolling-shutter door and motor control
- Security alarms
- Remote-control product production testing

4 Technical Specifications

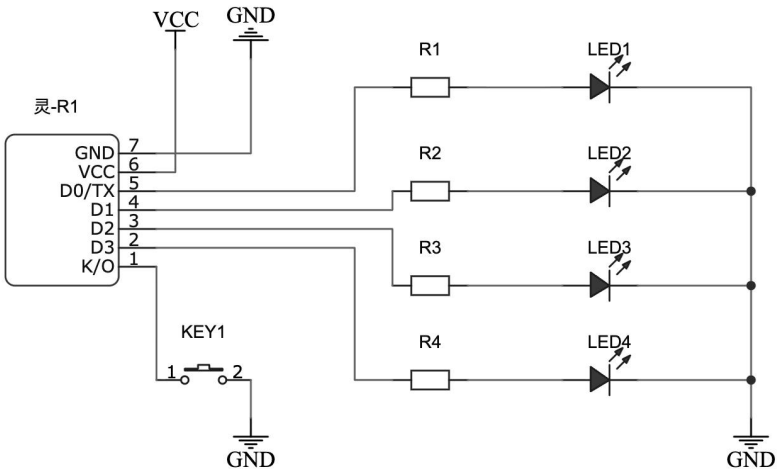
Parameter	Min.	Typical	Max.	Unit	Condition / Description
Operating Frequency	-	433.92	-	MHz	433.92 MHz option
Operating Voltage	2.6	3.0	5.5	V	Between VCC and GND.
Operating Current	-	6.9	-	mA	Typical value.
Modulation	-	ASK/OOK	-	-	Remote-control reception.
Receiver Sensitivity	-	-116	-	dBm	Typical value.
Data Interface	-	Switching outputs / serial	-	-	Specified by ordered model.
Serial Rate	-	9600	-	bps	M5/M5N serial versions; ASCII plain-text output.
Learnable Remote Controls	-	80	-	units	Retained without power.
Number of Outputs	-	4	-	channels	D0-D3 switching outputs.
I/O Drive Capability	-	-	15	mA	D0-D3 outputs.
Dimensions	-	22.23 x 11.43 x 2.50	-	mm	See dimensional drawing.
Operating Temperature	-30	-	80	°C	Verify for the complete-product environment.
Antenna Interface	-	50	-	ohm	TT02 antenna recommended.

5 Pins and Operation



Bottom View

Pin Name	Type	Function	Description
K/O	Input	Pairing Key	Double-press to enter pairing mode; press any remote-control key to pair.
D0-D3	Output	Four Switching Outputs	Switching outputs in M1/M3/M4 modes; D0 is serial output in M5/M5N mode. Maximum drive capability per I/O is 15 mA.
VCC	Power	Positive Supply	2.6-5.5 V; 3.0 V typical.
GND	Power	Ground	Use common ground with the host controller or external circuit.
ANT	RF	Antenna Interface	50 ohm antenna interface; TT02 antenna recommended.



Connection Diagram

Operation:

Option 1

Option 2

Option 3

6 Ordering Models and Operating Modes

No.	Model	Name	Output Behavior
1	Ling-R1PRO-M1_433	Toggle Version	Each remote-control press toggles the corresponding output state.
2	Ling-R1PRO-M3_433	Momentary Version	The corresponding output is high while the key is pressed and returns when released. Default version.
3	Ling-R1PRO-M4_433	Interlock Version	Only one of D0-D3 is high at a time; the others are low.
4	Ling-R1PRO-M5_433	Serial Version	D0 outputs decoded data through fixed 9600 bps serial communication.
5	Ling-R1PRO-M1N_433	No-Pairing Toggle Version	No learned pairing required; outputs follow toggle logic.
6	Ling-R1PRO-M3N_433	No-Pairing Momentary Version	No learned pairing required; outputs follow momentary logic.
7	Ling-R1PRO-M4N_433	No-Pairing Interlock Version	No learned pairing required; outputs follow interlock logic.
8	Ling-R1PRO-M5N_433	No-Pairing Serial Version	No learned pairing required; D0 outputs serial decoded data.

7 Output-to-Key Mapping

When using transmitters such as Ling-T3, Ling-T3A, and Ling-T3PRO, the pin mapping is as follows. For more keys, select M5N mode with Ling-T3MAX; up to 25 keys are supported.

Receiver Output	Key Value	Common Transmitter Key
D0	1	K3
D1	2	K2
D2	4	K1
D3	8	K0

8 Learning, Clearing, and Emergency Stop

Function	Action	Result
Learn Pairing	After power-on, quickly double-press KEY1. Once the status LED starts flashing, activate any key on Ling-T1L, Ling-T3A, Ling-T3MAX, or the remote control.	The status LED lights for about 1 second to indicate successful pairing. N versions require no pairing.
Clear All Remote Controls	After power-on, hold KEY1 for more than 8 seconds, then release it.	All learned pairings are cleared.
Emergency Stop	Briefly press the pairing key during operation.	D0-D3 all become low-level outputs.

After learning completes, the status LED no longer flashes continuously; it lights only when a learned remote-control signal is received.

9 Serial Output Format

M5/M5N serial versions output decoded data from D0. The serial interface is fixed at 9600 bps and outputs ASCII plain text, not raw HEX byte data.

Item	Parameter
Output Pin	D0
Serial Rate	9600bps
Data Format	ASCII Plain Text
Frame Header	LC:
Data Field	3 bytes of valid data represented by 6 hexadecimal characters
Checksum Field	1-byte sum checksum represented by 2 hexadecimal characters
Frame Tail	CRLF, i.e. \r\n

Example Frame:

```
LC:DAB10893\r\n
```

Field Definitions:

Field	Example	Description
Frame Header	LC:	Fixed frame header.
Address Field	DAB10	Corresponds to the 20-bit address code of 1527.
Key-Value Field	8	Corresponds to the key value of 1527.
Checksum Field	93	DA + B1 + 08 = 0x193; the low 8 bits are 0x93.
Frame Tail	\r\n	Carriage-return and line-feed characters; not visible.

10 MCU Serial-Parsing Routine Recommendations

The following routine framework illustrates reception and checksum verification for M5/M5N serial output. Adapt it to the MCU serial driver, receive-buffer length, timeout mechanism, and application state machine in the actual project.

```
#include <stdint.h>
#include <stddef.h>
/* Converts one ASCII hexadecimal character to 0x0-0xF.
 * Returns 0xFF if the character is not a valid hexadecimal character.
 */
static uint8_t R1PRO_HexCharToNibble(uint8_t ch)
{
    if (ch >= '0' && ch <= '9') {
        return (uint8_t)(ch - '0');
    }
    if (ch >= 'A' && ch <= 'F') {
        return (uint8_t)(ch - 'A' + 10);
    }
    if (ch >= 'a' && ch <= 'f') {
        return (uint8_t)(ch - 'a' + 10);
    }
    return 0xFF;
}
/* Parses output from the Ling-R1PRO serial version.
```

```
 * Example input: LC:DAB10893, optionally followed by \r\n.
 * out_data[0..2] returns 3 bytes of valid data.
 * Returns 1 if the header, characters, and checksum are correct; returns 0 for invalid data.
 */
uint8_t R1PRO_ParseAsciiFrame(const uint8_t *buf, size_t len, uint8_t out_data[3])
{
    uint8_t hex[8];
    uint8_t checksum;
    size_t i;
    /* At least 11 bytes are required: LC: + 8 hexadecimal characters. */
    if (buf == NULL || out_data == NULL || len < 11) {
        return 0;
    }
    /* Check the fixed header to avoid treating other serial data as remote-control data. */
    if (buf[0] != 'L' || buf[1] != 'C' || buf[2] != ':') {
        return 0;
    }
    /* Convert ASCII characters such as DAB10893 to eight 4-bit values. */
    for (i = 0; i < 8; i++) {
        hex[i] = R1PRO_HexCharToNibble(buf[3 + i]);
        if (hex[i] == 0xFF) {
            return 0;
        }
    }
    /* Combine every two ASCII hexadecimal characters into one byte.
     * The first 3 bytes are valid data; the fourth is the sum checksum.
     */
    out_data[0] = (uint8_t)((hex[0] << 4) | hex[1]);
    out_data[1] = (uint8_t)((hex[2] << 4) | hex[3]);
    out_data[2] = (uint8_t)((hex[4] << 4) | hex[5]);
    checksum = (uint8_t)((hex[6] << 4) | hex[7]);
    /* Checksum rule: add the 3 valid data bytes and retain only the low 8 bits. */
    if ((uint8_t)(out_data[0] + out_data[1] + out_data[2]) != checksum) {
        return 0;
    }
    return 1;
}
```

11 Power-Supply Design Recommendations

- Use a stable supply for VCC. Place a 0.1 uF decoupling capacitor close to the module and add suitable bulk capacitance according to load conditions.
- Keep power traces short and wide, and provide a low-impedance return path for GND.
- Relays, motors, buzzers, LED strips, and similar loads should not share a long, narrow power loop with the module.
- When debugging intermittent missed codes or unintended operation, use an oscilloscope at the module VCC/GND pins to observe voltage changes during load switching.
- Battery-powered applications should evaluate reception stability at low voltage, cold start, different temperatures, and late discharge.

12 EMC and Interference-Immunity Recommendations

- Keep the module and antenna area away from relay contacts, motor wires, switching power supplies, inductors, long harnesses, and high-frequency clock areas.
- Test reception success rate and false output triggering while loads such as relays, motors, and solenoids operate.
- Enclosures, batteries, metal panels, harnesses, and installation position affect reception; retest in the final structure.
- Production testing should not test only maximum distance; repeatedly trigger at fixed distance, direction, and supply conditions to verify the success rate.
- Where the complete product requires FCC/CE/SRRC/EMC or similar certification, rely on complete-product testing and formal reports.

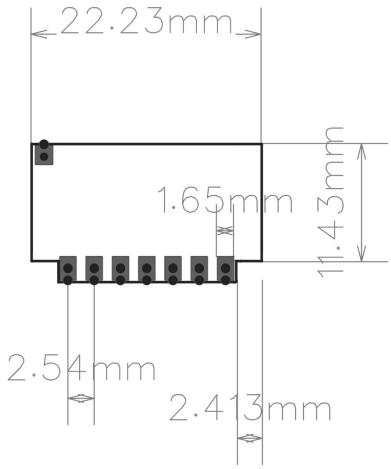
13 PCB Layout Recommendations

- Ensure low-impedance loops for module power and ground to avoid VCC fluctuations caused by load switching.
- Keep the ANT-to-antenna connection as short as possible and route it as a 50 ohm RF trace.
- D0-D3 and pairing-key lines should not be excessively long. Evaluate long input/output lines with ESD, debounce, and interference-immunity testing.
- Avoid high switching-current loops, relay-contact routing, and motor harnesses near the module.
- Keep RF, digital-output, and load-drive areas separated to reduce coupling.

14 Antenna and Mechanical Recommendations

- ANT is a 50 ohm antenna interface. Use a TT02 antenna matched to the operating frequency.
- Do not place copper areas, batteries, shields, metal enclosures, screw posts, or long harnesses near the antenna.
- Module orientation, enclosure material, and internal metal parts affect receiving distance; verify in the final structure.
- For the same product, fix the module position, antenna routing, and installation method to avoid inconsistent reception caused by antenna-environment variation between production batches.

15 Dimensions



16 Ordering and Technical Support

During selection and project introduction, confirm the operating mode, frequency, supply method, output logic, transmitter model, antenna type, enclosure structure, certification needs, and batch-test method.

Technical documentation, configuration software, and test tools are available from the FNRF Wireless website:

www.fnrf-tech.com

Appendix Antennas、Development Tools

Antennas are important. No antenna or an unmatched antenna can seriously affect performance. Actual performance also depends on the PCB, enclosure, and mechanical structure; purchase several types for practical testing.

TT02		433MHz	27.5mm*5.0mm

Development Tools:

Development Assistant	Signal Assistant
	
Difference: 1、Measures data values 2、Requires an encoding type (1527, etc.)	Difference: 1、Measures signal strength 2、No encoding restriction (ASK/OOK modulation)
Use: 1、Displays the address code and key value of a remote control/transmitter module 2、Displays remote-control frequency, pulse width, and encoding type 3、Volume testing of remote-control products	Use: 1. Displays signal strength of a remote control/transmitter module (relative value) 2. Compares antenna performance 3. Volume testing of remote-control products
Power Supply: TYPE-C	Power Supply: TYPE-C