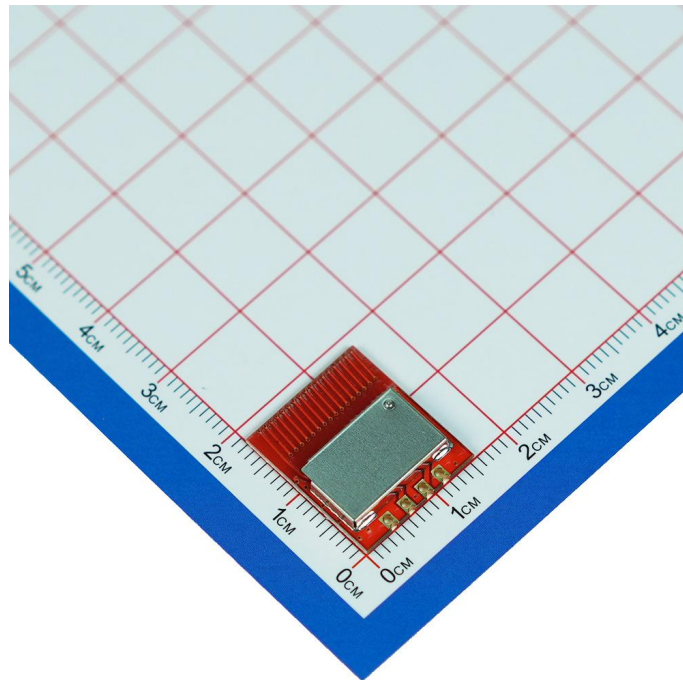




Yuan-T4A Remote Control Transmitter Module



Item	Content
Product Model	Yuan-T4A
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Brand	FNRF



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1 Product Overview

Yuan-T4A is an ASK/OOK remote control transmitter module with an integrated PCB antenna, operating at 433.92 MHz. It is suitable for compact transmitters where an external antenna is impractical and for coin-cell-powered products.

The module uses an RF transmitter IC with an integrated harmonic-suppression circuit. The DAT input accepts a digital modulation signal from an encoder IC or MCU, and the module performs ASK/OOK RF transmission according to DAT logic-level transitions.

2 Product Features

- 433.92 MHz ASK/OOK transmission.
- 2.0-5.5 V range; 3 V typical.
- Operating current: 9 mA typical at 3 V and 40% modulation duty cycle.
- Output power: 10 dBm typical at 3 V.
- Integrated PCB antenna, reducing external-antenna assembly requirements.
- Integrated harmonic-suppression circuit.
- Data rate: 0.1-9.6kbps.
- Suitable for coin-cell-powered products and compact remote control transmitters.

3 Typical Applications

- Remote control transmitters
- Smart-home remote control
- Home-appliance remote control
- Wireless switches
- Wireless doorbells
- Security alarm transmitters



4 Technical Parameters

Parameter	Minimum	Typical	Maximum	Unit	Conditions / Notes
Operating Frequency	-	433.92	-	MHz	Selected according to the ordered frequency.
Operating Voltage	2.0	3.0	5.5	V	Between VCC and GND.
Operating Current	-	9	-	mA	3 V supply, 40% modulation duty cycle.
Modulation	-	ASK/OOK	-	-	DAT input modulation.
Output Power	-	10	-	dBm	3 V supply.
Data Rate	0.1	-	9.6	kbps	DAT input data rate.
Frequency Deviation	-	±0.1	-	MHz	Typical frequency deviation.
Antenna Impedance	-	50	-	Ω	Integrated module PCB antenna system.
DAT Input Level	2.2	3.0	3.6	V	3 V-level input.
Operating Temperature	-40	-	85	°C	Verify according to the end-product environment.



5 Pin Assignment



Bottom View

Pin Name	Type	Function	Description
DAT	Input	Data Input	Connect to ASK/OOK modulation data from an encoder IC or MCU output.
VCC	Power	Power Positive	3.0V recommended; provide decoupling and filtering.
GND	Power	Power Negative	System ground.
ANT	RF	PCB Antenna	Integrated module PCB antenna area.

6 Data Input and Transmission Behavior

DAT is a 3 V-level data input and can be connected to an encoder IC or MCU output. DAT high/low transitions control ASK/OOK transmission; the module does not decode the upper-layer encoding protocol.

When the encoder IC or MCU output level exceeds the recommended DAT input range, connect a current-limiting resistor in series between DAT and the encoder IC/MCU. Use 22k Ω for 3.6–5 V outputs and 51k Ω for 5–12 V outputs.

Item	Description
Input Type	Digital modulation-data input.
Recommended Level	3 V level, range 2.2–3.6 V.
High-Level Input Risk	A series current-limiting resistor is required above the recommended range.
Protocol Boundary	The module performs ASK/OOK RF transmission only and does not decode address codes or key values.
Rate Range	0.1–9.6kbps.



7 Use and Connections

Option 1



Option 2



Option 3



The DAT pin receives digital pulse signals from an external encoder IC or MCU. The module performs ASK/OOK transmission according to DAT level transitions. DAT is not a UART interface and cannot directly transmit UART text data as a wireless UART module would.



8 MCU Transmission and Example Guidance

The Yuan-T4A DAT input accepts ASK/OOK modulation data. An MCU can use GPIO to output high/low pulses according to the target encoding protocol. The example below shows only a pulse-transmission framework; the preamble, address code, key value, and repeat-frame rules must be implemented for the actual protocol.

8.1 DAT Pulse-Output Example Framework

```
// Yuan-T4A DAT transmission example framework

// Concept: the MCU controls DAT high and low levels according to the encoding protocol; Yuan-T4A performs
ASK/OOK transmission according to the DAT level.

// Note: this example provides only a pulse-output framework and does not include 1527/2262 encoding-generation
logic.

// The actual product must determine the preamble, address code, key value, and repeat-frame count according
to receiver decoding requirements.

#include <stdint.h>
#include <stddef.h>

typedef struct {
    uint8_t level;      // DAT output level: 0 = low; 1 = high.
    uint16_t width_us;  // Duration of the current level, in microseconds.
} T4A_Pulse;

// Platform-specific function: set the DAT pin level.
extern void Board_SetT4aDat(uint8_t level);

// Platform-specific function: microsecond delay.
extern void Board_DelayUs(uint16_t delay_us);

// Output one high/low pulse.
static void T4A_SendPulse(uint8_t level, uint16_t width_us)
{
    Board_SetT4aDat(level);
    Board_DelayUs(width_us);
}

// Output a pulse sequence.
// pulses: pulse array generated according to the target encoding protocol.
// count: number of pulses.
void T4A_SendPulseFrame(const T4A_Pulse *pulses, size_t count)
{
    for (size_t i = 0; i < count; i++) {
        T4A_SendPulse(pulses[i].level, pulses[i].width_us);
    }
}
```



```
// After transmission, it is recommended to drive DAT low to prevent the module from remaining in an unintended transmit state.
Board_SetT4aDat(0);
}
// Example: transmit a remote-control frame generated in advance by the application layer.
// In an actual project, frame_pulses should be generated by the encoding-protocol layer from the address code and key value.
void T4A_SendKeyFrame(const T4A_Pulse *frame_pulses, size_t pulse_count)
{
    // Common remote-control protocols repeat multiple frames to improve reception reliability.
    // The repeat count should be determined according to receiver decoding rules, power consumption, and response-time requirements.
    for (uint8_t repeat = 0; repeat < 4; repeat++) {
        T4A_SendPulseFrame(frame_pulses, pulse_count);
        // Set the frame interval according to the target protocol; do not shorten it arbitrarily.
        Board_DelayUs(8000);
    }
}
```

8.2 MCU Implementation Recommendations

Item	Recommendation
DAT Default State	Drive DAT low after transmission.
Level Compatibility	When the MCU output exceeds 3.6 V, use a series current-limiting resistor or level adaptation.
Timing Accuracy	Use a timer or stable delay to implement pulse widths.
Repeat Frames	Set the repeat count and frame interval according to receiver protocol requirements.
Application Safety	Door-lock, motor, alarm, and similar applications should include address-code, key-value, and action-confirmation logic.



9 Power-Supply Design Recommendations

Yuan-T4A transmit current is 9 mA typical at 3 V and 40% modulation duty cycle. When powered by a coin cell or low-capacity battery, evaluate internal resistance, transient voltage drop, and supply capability at low temperature.

Item	Recommendation
Decoupling Capacitor	Place a 0.1 uF ceramic capacitor between VCC and GND near the module.
Bulk Capacitor	Add a 4.7-22uF bulk capacitor according to transmit-current pulses.
Battery Power	Evaluate voltage drop during button transmission to prevent low voltage from reducing power or causing frequency abnormalities.
Power-Supply Noise	Keep the module away from DC-DC inductors, switching nodes, and high-current loops.

10 EMC and Interference-Immunity Recommendations

- Keep the DAT trace short and away from switching power supplies, high-speed clocks, relay drivers, and motor wiring.
- Keep batteries, spring contacts, button wires, and enclosure structures away from the PCB antenna high-field region.
- Protect high-level DAT inputs using the recommended resistor to prevent input overvoltage from affecting module reliability.
- For end products with ESD or EFT requirements, provide system-level protection at buttons, external interfaces, and the power entry.
- Before mass production, verify transmission stability with the final enclosure, battery, button structure, and matched receiver.



11 PCB Layout Recommendations

- Place the VCC/GND decoupling capacitor near the module power pins and keep the loop area as small as possible.
- Keep the DAT trace short and direct; avoid long parallel routing with the antenna area, high-speed traces, or high-current traces.
- Do not place copper below the PCB antenna; do not route ground planes, power planes, or other signal traces there.
- Maintain clearance around the module antenna area and avoid nearby metal, batteries, and shielding structures.
- If the end product has enclosure clips, screws, spring contacts, or a battery compartment, check their relative positions to the antenna area during mechanical review.

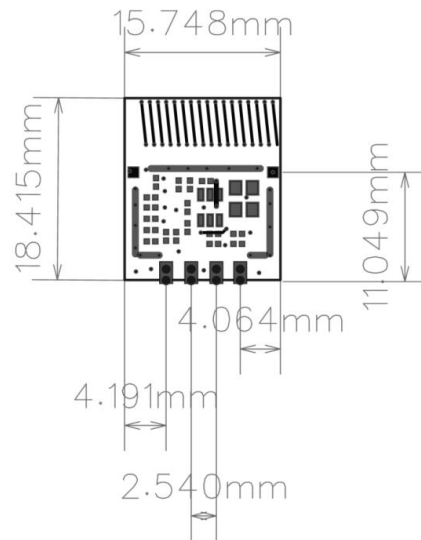
12 Antenna and Mechanical Recommendations

Yuan-T4A has an integrated PCB antenna; the antenna area is critical to transmission performance. Copper below or near the antenna, metal enclosures, batteries, spring contacts, or wire harnesses may alter antenna matching and radiation efficiency.

Item	Recommendation
Below Antenna	No copper, routing, or large metal objects.
Enclosure Material	Prefer a non-metal enclosure near the antenna area.
Validation Method	Test transmission range and stability with the final enclosure, battery, and installation orientation.



13 Dimensions



14 Documentation and Technical Support

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

www.fnrf-tech.com



Appendix 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