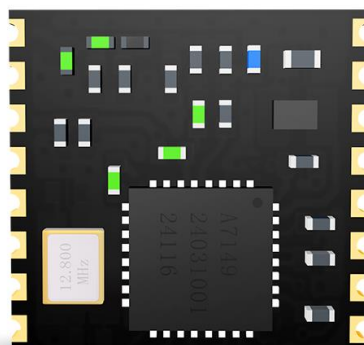


Ultra-low Power Consumption FSK Transceiver Module

SPECIFICATION

Model No.: DL-A7149-S

Version: V1.0



DL-A7149-S
433/868/915MHz

Before using this module, please pay attention to the following important matters:

This module is an electrostatic sensitive product. Please operate it on an anti-static workbench during installation and testing.

This RF module uses an external antenna by default, which is intended to be embedded in your product or application, and does not provide a casing itself. The antenna can be a wire antenna or a standard UHF antenna. You can choose a specific antenna according to the actual situation.

Metal objects and wires should be kept away from the antenna as much as possible. If the product uses a metal shell, be sure to install the antenna outside the metal shell. Otherwise, the RF signal will be seriously attenuated, which will affect the effective distance.

Disclaimer:

This specification is just for your information, all the charts and pictures used in this specification are for reference only. The actual test shall prevail for details. We do not assume any responsibility for personal injury or property loss caused by user's improper operation.

This specification is subject to change due to the continuous improvement and upgrading of the product version, and the latest version specification shall prevail. DREAMLNK reserves the right of final interpretation and modification of all contents in this specification.

File Version Update Management

Date	Version	Formulation / Revision of Contents	Approved by
2024-01-19	V1.0	DL-A7149-S Standard Version RF Module	Fagan Xu

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1. Product Introduction:

DL-A7149-S was designed base on AMICCOM A7149 wireless transceiver chip from Taiwan. It is a compact and low power RF transceiver module. This AMICCOM A7149 is an ISM band wireless transceiver chip, mainly set to 433/868/915/MHz ISM/SRD frequency bands, with very low power consumption (e.g.: power consumption under 434MHz band in RX mode is just 1.8mA @ AGC Off). Its link budget is very high, making it ideal for battery-powered long-distance wireless transmission applications. Its efficient Class E amplifier has an output power of up to 20dBm, a Max. sensitivity of -119dBm, and a Max. transmission rate of 250Kbps.

By using this RF module, you can easily develop an excellent wireless product, with good RF performance and high reliability, without having a deep understanding of RF circuit design.

1.1 Features:

- Compact size, SMD stamp edge half-hole encapsulation;
- Modulation method: FSK/GFSK;
- Working Voltage: 2.2~3.6V;
- Operating Frequency: 433MHz/868MHz/915MHz;
- Chip support speed range: 2-250Kbps;
- Low power consumption, receiving current 1.8mA (AGC Off);
- The maximum output power reaches 20dBm;
- High receiving sensitivity: -119dBm@2kbps;
- Independent 64BYTE transmit/receive data buffer;
- To reduce the power consumption, switching time between standby and receive state can be set (WOR function);
- Supports RSSI signal strength detection.

1.2 Applications:

- | | |
|--------------------------------|---|
| • ISM band data communication | • Smart Building |
| • Smart Home System | • Intelligent Security Monitoring |
| • AMR (Automatic Mobile Robot) | • Wireless Remote Control |
| • Wireless Sensor Networking | • Energy Control and Management |
| • RKE (Remote Keyless Entry) | • Heat energy collection, meter measurement |

2. Technical Parameter

Parameter	Min.	Typical	Max.	Unit	Remarks
Operating Conditions					
Working Voltage (VDD)	2.2	3.3	3.6	V	To ensure maximum chip power, stable voltage should $\geq 3.1V$
Communication Level Range	-0.3	3.3	3.6	V	Exceeding this range will damage the chip
Working Temperature Range	-40	25	85	$^{\circ}C$	The larger the temperature difference, the greater the bandwidth is required for communication
Current Consumption					
Receiving Current	1.8	2.2	3.8	mA	@DCDC WOR working mode can be used to reduce the overall working current
Transmission Current	97	117	137	mA	@433MHz: 19dBm, DCDC 50 Ω
	78	98	118	mA	@868MHz/915MHz: 17dBm, DCDC 50 Ω
Sleep Current	0.2	0.5	1	μA	Save via register
RF Parameters					
Transmit Power Range	-30	19	20	dBm	Software configurable
Receiving Sensitivity		-119 -117 -115		dBm	@433MHz, 2Kbps, IFBW: 50KHz @868MHz, 2Kbps, IFBW: 50KHz @915MHz, 2Kbps, IFBW: 50KHz
Communication Rate Range	2		100	Kb/s	@Different crystals result in varying rates, Max. up to 250K

Table 1: Technical Parameter

Remarks:

DL-A7149-S has two prominent performances:

1. The power consumption in the fully receiving state is only 1.8mA,
2. Support a wide communication rate range, up to 250Kbps,

Note: FSK transceiver chips from Ti-chipcon, Silicon Labs, Semtech and other international brands which are currently used in ISM band applications, usually consume about 10 mA of receiving power. Most systems for industrial control and data acquisition are powered by batteries, and require a period of 3-5 years, while the average power consumption of the transceiver chips from above brands is relatively high. But this A7149 chip combines ultra-low power MCU and optimizes its software algorithms, which can achieve an optimal power planning.

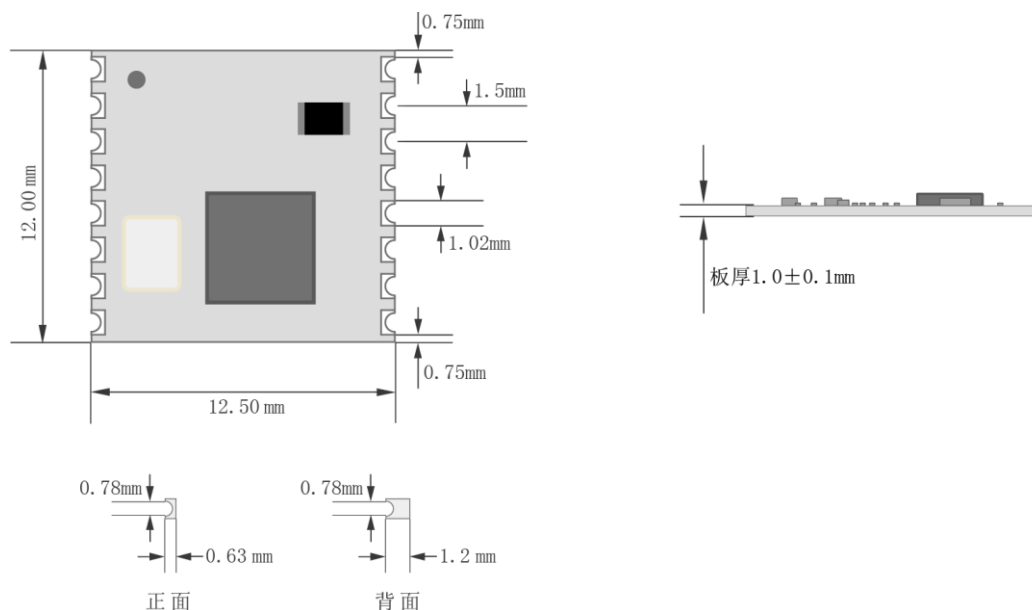
3. Pins Definition:



No	Definitions	Type	Description
1	ANT/NC	AI/AO	RF signal input/output port, π -matching circuit must be reserved; Adopt 50 Ω impedance matching for RF routing, route the ground and add via holes around it
2	GND	PWR	Reliable grounding
3	3.3V	PWR	To ensure maximum chip performance, a stable voltage ($\geq 3.1V$) is required
4	GPIO2	O	Function can be configured through the SPI interface
5	GIO1	O	Function can be configured through the SPI interface
6	SDIO	IO	SPI data input/output
7	SCK	I	SPI Serial Clock Input, connected to the SCLK of MCU
8	SCS	I	SPI Chip Select Input, connected to the CSN of MCU
9	GND	PWR	Reliable grounding
10	NC	NA	No connection
11	NC	NA	No connection
12	PDNHA	I	DC-DC PWM mode control, high level for sleeping
13	NC	NA	No connection
14	RST	I	Hardware reset to increase its stability, chip initialization, low-level reset
15	CKO	O	SPI Serial Clock output, no connection is needed
16	GND	PWR	Reliable grounding

Table 2: Pin Definitions

4. Module Size & SMT



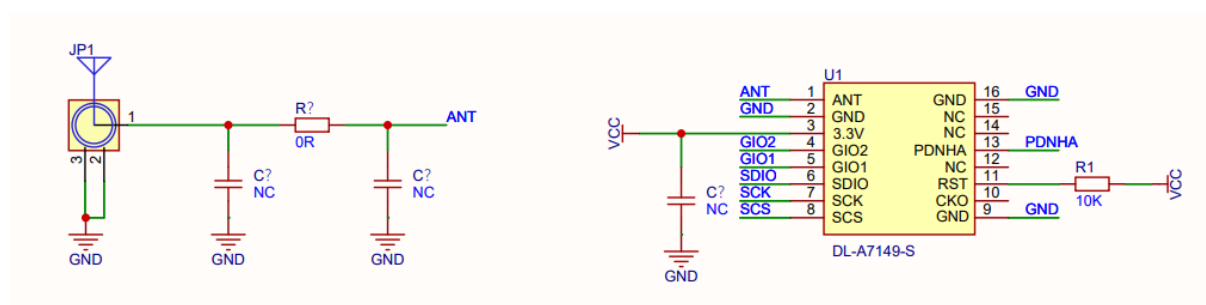
Footprint files can be provided, please ask our sales person if needed.

Footprint files format description:

- * .ASC format can be opened with Protel99se;
- * .DXF format can be opened with CAD;
- * .PCB format can be opened with PADS software;

Module packaging: SMT placement (steel mesh thickness $\geq 1.2\text{mm}$)

5. Application Connection Diagram



System Application Diagram

I/O Design Instructions:

- When doing the hardware design, at least three wires of SPI (SDIO, SCK, SCS) and GIO2 need to be connected to the GPIO of the MCU;
- The software obtains the status through GIO2 to detect the completion of sending and receiving, and the pin is valid at high level;

- PDNHA mode control pin is normally at low level, please set it to high level when entering sleep mode (to reduce power consumption);
- If you want to achieve low-power reception, WOR mode need to be set, and the SDK defaults to setting GIO1 as the channel status indicator signal;
- RST reset pin is low level active, it must be set to high level, or controlled by MCU; otherwise (RST no connection under sleep mode) will affect power consumption;

6. Circuit Design

6.1 Power Supply Design

- Please pay attention to the power supply voltage of the device, exceeding the recommended voltage range may cause function abnormally and permanently damage;
- Try to use a DC stabilized power supply, and the power ripple coefficient should be as small as possible; the power load when transmitting the maximum power needs to be also considered;
- The module needs to be grounded reliably, and a good grounding can achieve better performance output and reduce the impact of RF on other sensitive devices.

6.2 RF Routing Design

- The module should be far away from RF interference sources, such as high-frequency circuit transformer, and please do not directly route at the lower layer of the RF module. Otherwise, the receiving sensitivity may be affected;
- When using the on-board antenna, the antenna needs to be clear on both sides, and the ground should not be too close to the antenna at the same time, otherwise it will absorb the radiated energy;
- Route 50Ω impedance line, lay the ground and add more via holes around it
- If there is enough space on your PCBA, please reserve a π -type matching circuit, and it needs to be placed as close to the chip end as possible, please make it grounded and add via holes around it. Do remember to connect it through a 0R resistor, otherwise the antenna will open circuit; SMA ANT circular through-hole requires clearance treatment

6.3 Antenna Design

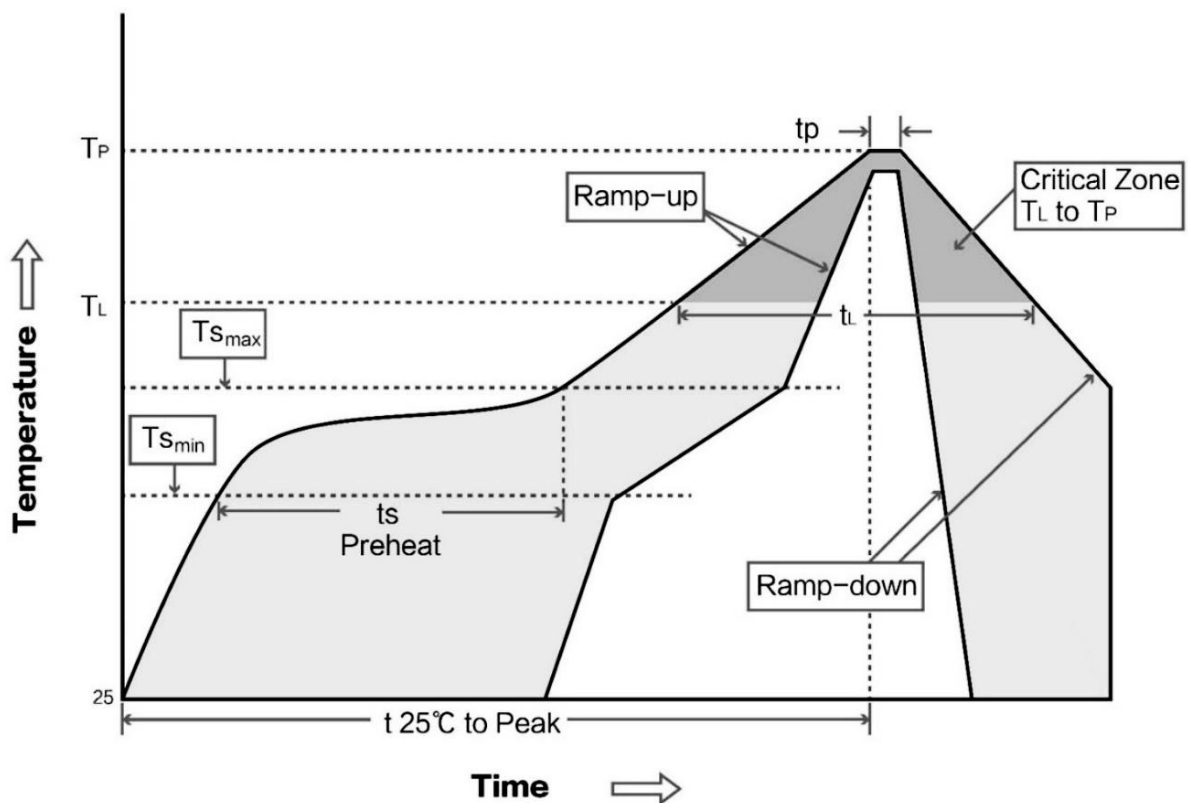
- There are many types of antennas, please choose the appropriate antenna according to your needs;
- Choose a suitable position to place the antenna, according to the antenna polarity. And it is recommended to be vertically upward;
- There should be no metal objects in the antenna radiation path, otherwise the transmission distance will be affected (such as a closed metal casing).

6.4 Wireless interference

For high-power wireless transmission, wireless interference may occur, which may affect the functions of some sensitive circuits, such as amplifiers, ADCs, RESETs, and data pins with low driving force. This situation has a significant impact on high-power transmission at 20dbm and above. The interference mainly comes from the antenna power being amplified and coupled to longer lines or devices through conduction or radiation. Therefore, when making the hardware design, the signal routing should be as short as possible; when using high power, try to use external antennas as much as possible, stay away from PCB sensitive devices, and add 100pF ground capacitance in sensitive device circuits to filter out high-frequency interference in low-speed signals to reduce wireless interference in other circuits.

7. Welding Operation Guidance

7.1 Reflow Soldering Curve Chart



7.2 Reflow Soldering Temperature

IPC/JEDEC J-STD-020B the condition for lead-free reflow soldering	Big size components (thickness ≥ 2.5 mm)
The ramp-up rate (Tl to Tp)	3°C/s (max.)
Preheat Temperature	
- Temperature Minimum (T _{smin})	150°C
- Temperature Maximum (T _{smax})	200°C
- Preheat Time (ts)	60~180s
Average ramp-up rate (T _{smax} to Tp)	3°C/s (Max.)
- Liquidous temperature (TL)	217°C
- Time at liquidous(tL)	60~150 second
Peak Temperature (Tp)	245+/-5°C

8. Notice for module application

- (1) This module is an electrostatic sensitive product. Please operate on an anti-static workbench during installation and testing;
- (2) When installing the module, make sure that nearby objects keep a sufficient safe distance from the module to prevent short-circuit damage;
- (3) Liquid substance is not allowed to come into contact with this module, and this module should be used in a dry environment;
- (4) Please use an independent voltage stabilizing circuit to supply power to this module, and avoid sharing with other circuits. The tolerance of the power supply should not be less than 5%.
- (5) The indicators of this module are accord to commonly used international standard. If special certifications needed, we can adjust certain indicators according to your needs.

9. Contact us

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★ Data collection, Smart home, Internet of Things applications, Wireless remote control technology, Remote active RFID, Antennas ★

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