

INDUSTRIAL-GRADE
WIRELESS MODULE

Silicon Labs EFR32FG23 SoC-Based High-End RF Module
Empowering Long-Range, Low-Power Design for the Industrial IoT (IIoT)



All-Round * Power-Saving * High-Security * Long-Range * Anti-Interference * Ultra-Fast

WIRELESS MODULE

- * **EFR32FG23 SoC BASED**
- * **MULTIPLE PROTOCOLS**
- * **INDUSTRIAL-GRADE**



EFR32FG23



Ultra-Low
Power



Secure Vault



High Data Rate



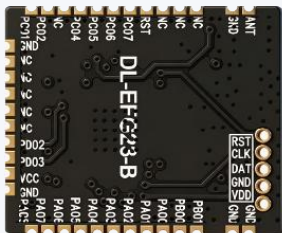
Ultra-Low
Power

Brief Introduction

产品展示



DL-EFG23-B
Front side



DL-EFG23-B
Back side

Hardware Features

- Supports a wide voltage range: 1.7~3.8V;
- Sleep current: <1uA (EM4 mode);
- High-efficiency receiving performance (RX current: 8mA);
- TX transmission power: up to +20dBm;
- Excellent receiver sensitivity:
 - 110dBm@433MHz 50Kbps @2FSK
 - 123dBm@868/915MHz 2.4Kbps@2FSK
- Accurate signal strength indication and channel evaluation

Software Features

- Supports AT commands and transparent transmission
- Supports data flow control in transparent transmission mode;
- Supports any serial port baud rate from 2400 to 921600 bps;
- Supports RSSI acquisition at any time for channel idle detection;
- Supports channel switching to avoid co-frequency interference;
- Supports fixed-point, broadcast, and monitoring transmission modes

Parameters	Specifications
Working Voltage	1.7~3.8V
Frequency	433/470/868/915MHz
Temperature	-40~85°C
Receiving Current	7.5~8.5mA
TX Current	145mA@433MHz; 140mA@868MHz
Sleep Current	<1uA
TX Power Range	20dBm
Transmission Rate	2.4kbps~2Mbps
Dimensions	17.46*20.16*2.5mm
Receiving Sensitivity	-125.8 dBm@915MHz@4.8 kbps@O-QPSK -123dBm@868MHz@2.4kbps@2FSK -110dBm@433MHz@50kbps@2FSK

Key Features Overview



SoC Core Performance

ARM Cortex-M33 @78MHz |
256KB FLASH | 32KB RAM

Supports complex applications and
concurrent multi-protocol processing



Multi-Protocols

Wi-SUN / Sidewalk / Wirepas /
WM-BUS / Private Protocol

Adapts flexibly to different scenarios



Fast Deployment

Built-in standard AT command,
supports secondary development

Lowers the barrier and significantly
shortens product time-to-market



High Rx Sensitivity

-125.8 dBm @915MHz/4.8kbps

Ultra-Strong Weak Signal Capture,
Enhances communication reliability



Long-Range Tx Power

+20 dBm high power output

Strong signal penetration, covers
up to 3 km



High Data Rate

Max. physical rate up to 2 Mbps

Capable of handling high-speed
data transmission



Ultra-Low Power

EM2 deep sleep current < 1 μ A

Battery-powered operation for 3–10
years, reducing maintenance costs



High-Level Security

Secure Vault Encryption | PSA
Level 3 Certification

Comprehensive protection
against physical and cyberattacks



Industrial-Grade

Wide Temperature & Voltage
Range: -40°C~+85°C | 1.7 ~ 3.8V

Ensures long-term stable operation
in harsh industrial environments

Stable Connection (Sub-Ghz)



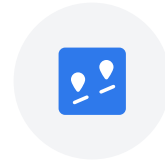
Anti-Interference Capability

The 2.4GHz band is quite crowded and suffers from severe interference, while Sub-GHz band has fewer devices and a relatively "cleaner" environment, effectively avoiding co-channel interference and ensuring communication link stability.



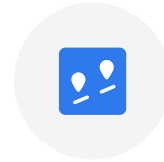
Penetration & Diffraction

Low-frequency signals have longer wavelengths and stronger physical penetration, easily passing through industrial obstacles such as walls and metal cabinets. Through diffraction effects, they can cover blind spots behind obstacles, achieving wider effective coverage.



Ultra-Long Range

Compared with 2.4GHz, the Sub-GHz band experiences lower signal attenuation. At the same transmit power, it can achieve several times greater communication distance, making it ideal for complex industrial scenarios that require large-area, long-range coverage.



410~510MHz 830~960MHz

@433MHz/470MHz RF Module
@868MHz/915MHz RF Module
Avoids the crowded interference of the 2.4GHz band (Wi-Fi / Bluetooth), offers strong diffraction capability, and is suitable for complex buildings / industrial environments. High speed & stable connection.

Multi-protocols Supported

Wide protocol stack support empowering full-scenario IoT connectivity ecosystem.



Wi-SUN Protocol

An IPv6 mesh network protocol specifically designed for smart grids and smart cities, featuring high stability and self-networking capabilities.



Amazon Sidewalk

A low-power wide-area network launched by Amazon, seamlessly connecting consumer terminals and community IoT device ecosystems.



WM-BUS Standard

A wireless communication protocol compliant with European standards, designed for water, electricity, gas, and heat meters, widely used in smart metering applications.



Wirepas Mesh Industrial-grade Networking

With strong self-healing capabilities and high concurrency, supporting massive node access, it is an ideal choice for large-scale, high-density industrial deployment.



Private Protocol Customization and Flexible Development

Provides a comprehensive SDK development kit and secondary development interfaces, allowing users to quickly build and deploy custom private protocols to meet different requirements.

Easy to Develop



Built-in AT Command

Quick Configuration • Out-of-the-Box

-
- Standard AT commands are provided, no need for in-depth underlying driver and protocol stack development.
 - Module configuration and data transmission/reception can be quickly completed via a universal serial port.
 - Greatly simplifies the product's early-stage functional evaluation and later-stage system integration process.



Secondary Development

Open SDK • Feature Customization

-
- For deep customization customers, a complete development SDK and toolchain support are provided.
 - Supports application development on the high-performance ARM Cortex-M33 core.
 - Meets the requirements for complex business logic and personalized functions in IoT scenarios.

Excellent RF Performance



Ultra-high Receive Sensitivity

-125.8 dBm

@ 915 MHz, 4.8 kbps

Capable of capturing extremely weak signals, serving as the core guarantee for long-distance, reliable communication.



High Transmit Power

+20 dBm

Max Output: 100mW

Strong signal penetration effectively overcomes interference from obstacles in complex industrial environments.



Long Communication Distance

3.0 km

Line of Sight (LOS)

The coverage meets the deployment requirements of most industrial plants and outdoor surveillance scenarios.

Power Consumption & Reliability

Ultra-Low Power Consumption



Deep Sleep Current (EM2 Mode)

Current consumption is less than **1 μ A**, an industry-leading level that minimizes power waste.



Ultra-long Battery Life

Standard lithium batteries can support continuous operation for **3 to 10 years**, significantly reducing later equipment maintenance and replacement costs.

Industrial-Grade Reliability



Wide Operating Temp. Range

Supports ambient temperatures of **-40°C ~ +85°C**, can withstand extreme industrial environments such as severe cold or high heat.



Wide Voltage Input Range

Compatible with a voltage range of **1.7V ~ 3.8V**, suitable for various mainstream power supply solutions such as coin cells and lithium batteries.

Extremely High Security



High-Performance Encryption Engine

Built-in hardware acceleration module fully supports mainstream industrial-grade encryption algorithms such as AES, SHA, and ECC, ensuring data confidentiality.



Secure Boot

Strict firmware authentication mechanism ensures that only digitally signed, authorized trusted firmware can be loaded and executed.



Secure Debug Lock

Locks the chip's debug interface, effectively preventing unauthorized external parties from illegally reading the device's internal program, keys, and sensitive data.



Physical Tamper Detection

Monitors real-time anomalies in voltage, clock frequency, and physical intrusion. Once an attack is detected, it immediately triggers a secure erase response.



Wireless Transparent Encryption

Supports transparent encryption of data transmitted over the air, ensuring that data cannot be eavesdropped upon in complex industrial wireless network environments.



International Security Certification

Awarded PSA Certified Level 3 hardware security certification and fully complies with the IEC 62443 industrial network security standard.

Comparison of Similar RF Solutions

Part Number	EFR32FG23 Silicon Labs	CC1312R TI	CMT2300A HopeRF	UM2011A UnicMicro	SX1262 Semtech
Chip Type	SoC (Built-in MCU)	SoC (Built-in MCU)	RF Transceiver	RF Transceiver	RF Transceiver
Memory	ARM Cortex-M33 256KB Flash / 32KB RAM	ARM Cortex-M4F @48MHz 352KB Flash / 80KB RAM	×	×	×
Frequency	Sub-GHz	Sub-GHz	127M~1020MHz	200M~1050MHz	150M~960MHz
Max. TX Power	20dBm	14dBm	20dBm	20dBm	20dBm
TX Current	85.5 mA @+20dBm	25 mA @14dBm	85mA @20dBm	80mA @20dBm	118mA @22dBm
RX Current	3.7 mA @2.4kbps	5.3mA	8.5mA	11mA	4.2mA
RX Sensitivity	-125.8 dBm @4.8kbps	-121 dBm @5kbps	-121 dBm @5kbps	-121 dBm @5kbps	-121 dBm @5kbps
Data Rate	2.4kbps~2 Mbps	0.625kbps ~ 4Mbps	0.5~300kbps	0.5~300kbps	LoRa 0.018~62.5kbps FSK 0.6~300kbps
Modulation/Protocol	2/4(G)FSK/OQPSK DSSS/(G)MSK/ OOK/Wi-SUN/Sidewalk/ WM-BUS/Wirepas/Private protocol	MSK/(G)FSK/OOK /Private protocol/mioty	OOK/(G)FSK/(G)MSK/ Private protocol	OOK/(G)FSK/(G)MSK/ Private protocol	LoRa/(G)FSK/Private protocol/LoRaWAN
Hardware Encryption	✓	×	×	×	×

Industrial Internet of Things (IIoT) Application



Communication Challenges in Complex Environments



Equipment monitoring and AGV communication face issues such as strong electromagnetic interference and limited transmission distance, urgently requiring a communication solution with low latency, high stability, and security compliance.



Strong Anti-Interference

Sub-GHz frequency band, avoiding 2.4GHz interference



ms-Level Real-Time Response

Local processing achieves <10ms low latency



Industrial-Grade Security

Compliant with IEC 62443 security standards



Broad Protocol Compatibility

Easily integrate protocols such as Wirepas Mesh



Core Application Scenarios

Real-time monitoring of critical equipment status and fault warning

AGV automated dispatch system and smart warehouse logistics coordination

Smart Metering Applications

Achieving Efficient and Reliable Automatic Meter Reading Systems



Smart Water Meter Terminal

Low Power • Wide Coverage • High Security



Industry Core Pain Points

Traditional meters face issues such as short battery life, difficulty in signal penetration into basements, complex networking of massive nodes, and risk of data tampering, resulting in high operation and maintenance costs.



Ultra-Long Battery Life

Extremely low power design, no external power supply required, supporting battery life of **10+ years**.



Wide Coverage

Excellent receive sensitivity and diffraction capability, easily covering signal dead zones such as basements and pipe wells.



High Security

Built-in hardware encryption engine with anti-tampering mechanisms, effectively preventing risks of electricity theft and data forgery.



Massive Node Supported

Supports Wi-SUN FAN / WM-BUS protocols, easily building city-scale networks covering millions of nodes.

Smart City Solutions



Core Node of Smart City Perception Network

— Smart Streetlights & Environmental Monitoring Terminals —



Core Industry Pain Points

These applications (e.g.: smart streetlights, fire alarms) often require wide-area coverage, while facing challenges including dispersed outdoor devices, high maintenance costs, but harsh environments (extreme heat/cold).



Core Advantage: Industrial-Grade Wireless Sensing Solution

Long-Range Coverage: Communication distance up to 1–3 km, significantly reducing gateway deployment.

Ultra-Low Power Consumption: Supports solar + battery power for maintenance-free outdoor operation.

High Reliability: Wide temperature design from -40°C to +85°C, adaptable to all-weather harsh environments.



Typical Applications: Urban Infrastructure Monitoring

Widely used in remote control of smart streetlights, real-time alarms for urban fire hydrants/smoke detectors, and tilt/movement monitoring of smart manhole covers – critical to urban lifeline projects.

Smart Agriculture Application



Core Industry Pain Points

Agricultural scenarios are often located in remote fields, lacking stable power supply, with complex terrain and long distances between monitoring points. Moreover, outdoor environments impose extremely high requirements for water resistance, dust protection, and weather resistance of equipment.



Technical Solution Advantages

Ultra-Long Communication Range: communication distance up to 3-5 km in open farmland, covering large planting areas.

Extreme Low Power Consumption: battery-powered operation lasting 5-10 years, adapting to the long-cycle characteristics of agriculture.

High Reliability: strong anti-interference capability ensures stable data transmission in complex terrain.



Typical Application Scenarios

Soil moisture monitoring, meteorological station environmental data collection, smart irrigation automatic control, and remote monitoring of livestock breeding environments.

Smart Home & Security



Typical Application: Smoke Detector



Limitations of Traditional Solutions

Traditional Wi-Fi/Zigbee solutions suffer from poor wall penetration, severe interference in the 2.4GHz band, and short sensor battery life, making it difficult to achieve true whole-home smart coverage.



Seamless Coverage and High Security

Wall penetration capability > 5 walls, ensuring no signal dead zones; sensor battery life up to **3–5 years**; built-in hardware AES encryption for comprehensive home data security.



Typical Application Scenarios

Widely adapted to terminal devices such as door/window sensors, smoke detectors, water leak sensors, and smart switches, building a full-spectrum home security and automation system.

Why Choose this DL-EFG23-B Module?



Peak Performance

Industry-leading performance that breaks through distance and penetration limitations in complex industrial environments.



High Security

Built-in hardware-grade industrial security mechanisms to fully protect your critical business data.



Power Efficiency

Ultra-low power optimization design supporting up to 10 years of battery life, significantly reducing long-term operating costs.



Development Efficiency

Flexible and easy-to-use development kits with a complete SDK, supporting secondary development to significantly accelerate time-to-market.



Future-Ready

Support for rich communication protocols and powerful edge processing capabilities, ensuring your products remain competitive for years to come.

Thank You!

◆ RF Expert • IoT Solution Provider ◆

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