

ULTRALOW-POWER, LOW-COST, 2.4GHz WAKEUP RECEIVER IN TSMC 90nm CMOS

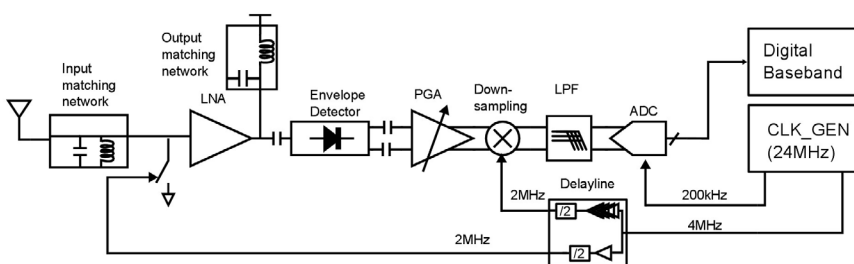
DESCRIPTION

The wakeup receiver offers a superior low-cost wireless solution for applications with stringent battery life time requirement. The receiver operates at 2400MHz ISM band. It supports the main radio to carry out ultralow-power channel monitoring, and wake up the main radio only when a valid trigger packet is detected.

Different from other wakeup receiver designs, which needs a pair transmitter to send the data that fulfills a certain packet structure, this wakeup receiver can pair with any transmitter operating at 2400MHz, as long as the signal is with a constant envelope. As we know, the popular standards, Bluetooth Low Energy (BLE) and Zigbee, both adopt the modulation scheme with a constant envelope. This also means that this wakeup receiver can work directly with existing systems to provide a very low-power channel monitoring.

The receiver SoC integrates analog front end (AFE), digital base band (DBB), and clock generation system, which makes the receiver a complete solution ready for use.

RECEIVER BLOCK DIAGRAM



Preliminary specs

KEY FEATURES

Wakeup receiver works with

- a BLE/Zigbee compliant transmitter, or any other transmitters with a constant envelope

SoC solution

- Complete receiver on a single chip
- Operates at 2.4GHz
- <=2Mbps

Ultra-low power solution

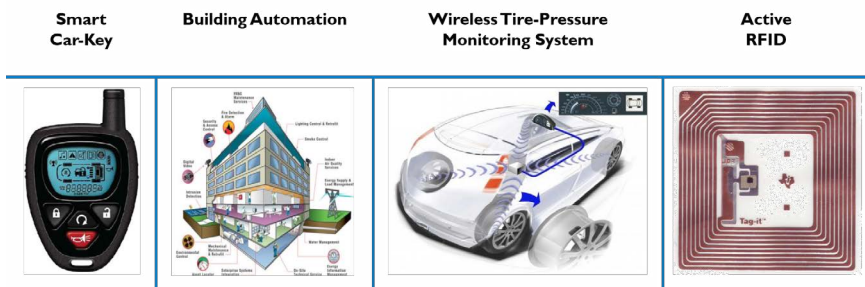
- Less than 260µW active power enabling low-power latency sensitive communication

Complete evaluation kit

- Offers flexibility to application development

APPLICATIONS

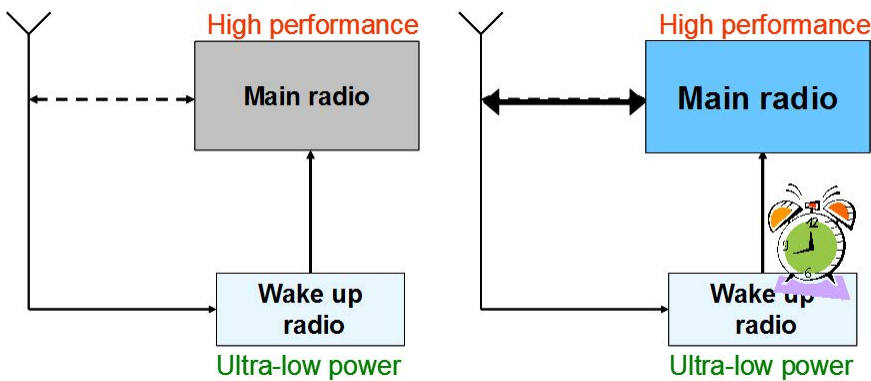
- Remote controls for consumer electronics
- Home automation
- Healthcare monitoring
- Smart car key
- Logistics
- Infrastructure monitoring
- Ultralow-power sensor networks



APPLICATION SETUP

Ultralow-power receiver to assist another high performance radio as dual radio solution.

The wakeup receiver is operating as a channel monitoring receiver. It detects the event, and wakes up the high performance main radio. The dual radio system is suitable for applications with very low-power budget, high data rate, and stringent latency requirement. More specifically, no special design for the pair transmitter is needed. The receiver is based on energy detection, and it can pair with any existing system with constant envelope signal, such as BLE and Zigbee, which makes the dual radio setup easily integrated with other standard-compliant systems.



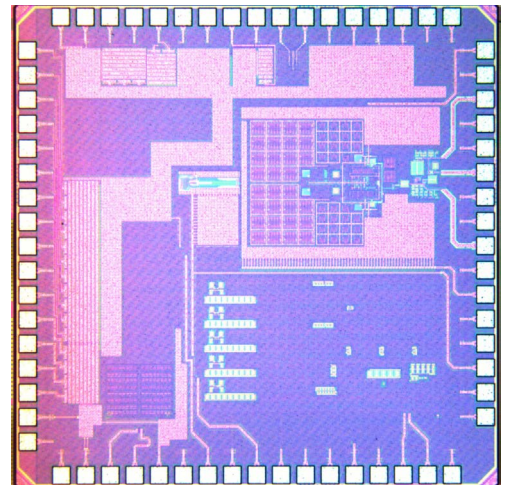
EVALUATION BOARDS

Imec provides evaluation boards on request to prospective customers and partners interested in licensing imec's radio designs and IP.

Metis PCB + wakeup receiver SoC: Enables complete evaluation of the wakeup receiver and further development and testing of dual radio setup.

Wakeup receiver soc	Specifications
Frequency band	2400MHz ISM band
Data rate	<=2Mbps
Modulation	GFSK, O-QPSK
PHY layer	Dynamic packet length Dynamic gain control Automatic packet detection
Supply voltage	1.1V
Current consumption	236µA
Maximum input power	-30dBm
Measured sensitivity	-60dBm (*)
RSSI resolution	±3dB
Xtal OSC Start Up Time	<700µs
ADC ENOB	>8-bit
Packet length detection accuracy	10µs
Technology	TSMC 90nm LP CMOS

Note: 67dBm sensitivity could be expected given that the known improvements to be implemented.



Wakeup SoC

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