# LOW-POWER WIDE AREA SOC RADIO TSMC 40nm CMOS

DESCRIPTION

Imec's subGHz multi-standard radio is designed for the IEEE 802.15.4g/k standards with frequency-shift-keying (FSK) modes. It achieves best-in-class performance at world's lowest-power consumption and operates in industrial, scientific and medical (ISM) and short-range devices (SRD) bands, covering from 780MHz to 930MHz.

The design focuses on low-power, large link budget, robustness to interference and low bill of material. The subGHz radio has been designed and taped out in 40nm CMOS technology.

The SoC includes a complete low-/zero-IF receiver chain from LNA to ADC, a transmitter power amplifier, and a DC/DC converter which supplies the class-D PA, a transmitter-receiver (TRx) switch, a complete power management unit (PMU) including power supplies and bias references, an ADPLL for carrier generation. A clock generator for 32MHz and 32kHz clock signals is integrated.
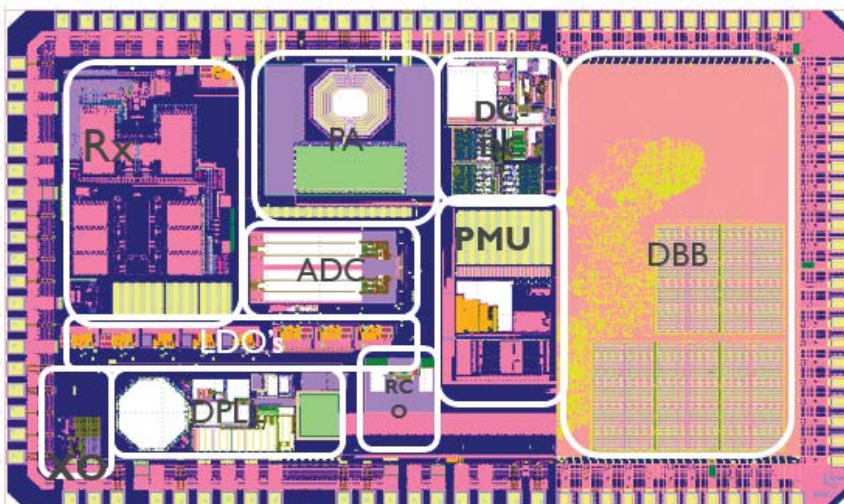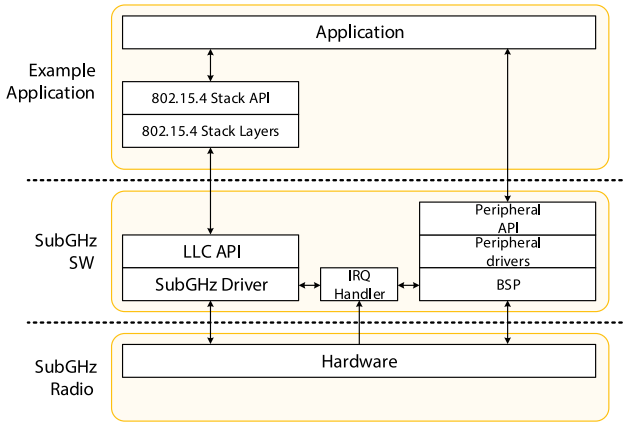

BLOCK DIAGRAM subGHz RADIO
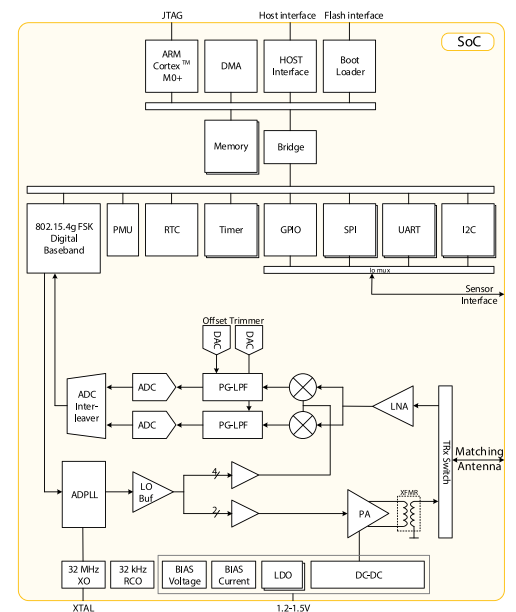
The ARM™ Cortex™-M0+ based system enables SW development and testing of the analog front-end and digital baseband features. It includes 160kBytes of SRAM and peripherals like SPI, I2C and UART.

The DBB aims for compliancy with the IEEE 802.15.4g standard in mandatory modes for FSK modulation.

The subGHz SW provides an abstraction level (LLC API) to control the basic functions of the AFE transceiver such like packet receive, transmit, set channel etc. On top of the LLC API the stack layers can be mapped. These are not included into the subGHz radio.

SUBGHz SPECIFICATIONS

Standards supported by front end	Wireless MBUS, Konnex-RF, IEEE 802.15.4G-SUN, IEEE 802.15.4k-LECIM
Frequency band	780 - 930MHz
Modulation	2,4-FSK/GFSK/MSK/GMSK
Data rate	50/100/200kbps
Channel spacing	100/200/400kHz
Pdc tx (wo/with pmu) (At +13dbm)	66/79mW
Pdc rx (wo/with pmu)	8/10mW
Tx pout max	+15dBm
Harmonic spurs	< -30 dBm
Rx sensitivity	-120 dBm @ 1 kbps / -105 dBm @ 50 kbps
In-band channel rejection	-37dB (adjacent) / -46dB (alternate)
Out of band blocker rejection	53dB @ fc+1MHz / 75dB @ fc+10MHz
Image rejection	38dB
Technology	TSMC 40nm LP CMOS

KEY FEATURES

Afe 40nm Ip subGHz multi-standard frontend
- IEEE 802.15.4g-SUN, Wireless MBUS
- KNX-RF
- IEEE 802.15.4k-LECIM covering 780-930MHz

SubGHz digital baseband
- IEEE 802.15.4g (FSK) Mandatory modes

Ultralow-power consumption
- Rx: 8mW
- Tx: 66mW (at 13dBm)

SENSITIVITY OF –120dBm @ 0.1% BER AND 1kbps

Integrated pmu (dc-dc, ldo's)
- Operating from 1.2-1.5V Battery supply (update for 3.6V battery support is ongoing)

Integrated microprocessor platform
- ARM Cortex™ M0+ core, 160kB SRAM, SPI, UART, I2C, GPIO

6 External critical components
- (2C and 2L for matching, 1C and 1 L for DC-DC)

Sculptor afe evaluation board

APPLICATIONS
- Smart buildings
- Critical infrastructure monitoring
- Home and commercial automation
- Wireless sensor node

EVALUATION BOARDS

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

Sculptor evaluation board
Enables evaluation of the subGHz SoC and further development SW layers.

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