Monarch SX
LTE-M/NB-IoT System on Chip

Single Chip LTE Cat M1/NB1 SoC with embedded processor for the Internet of Things

Monarch SX is a highly-integrated single-chip LTE-M (Cat M1) and NB-IoT (Cat NB1) system-on-chip (SoC) with an embedded processor designed specifically for small form-factor, narrowband IoT applications, including trackers, sensors, wearables, and other low data-use, low power M2M and IoT devices. Monarch SX integrates Sequans’ Monarch, the world’s first and most highly optimized LTE-M and NB-IoT platform, and first to be certified by a tier-one operator, with an ARM® Cortex®-M4 processor, voice and audio engines with support for VoLTE on LTE-M, an always-on, ultra-low power sensor hub, and an advanced display controller to support a graphical user interface with touch screen functions. The Monarch SX modem complies with the ultra-low-power and reduced complexity feature requirements of the 3GPP release 13 LTE Advanced Pro standard, defining narrowband, low data rate LTE technology for machine-type-communications (MTC). Monarch SX achieves a very high level of integration whereby the ARM Cortex-M4 processor, dedicated media processing unit, sensor hub, baseband processor, RF transceiver, power management unit, and RAM are integrated into a tiny 9 mm x 9.65 mm package, meeting the footprint requirements for the very smallest of IoT devices. Monarch SX runs Sequans’ SDK with a carrier-proven LTE protocol stack, an OMA lightweight M2M (LWM2M) client for over-the-air device management, a media engine, a sensor hub engine, and a royalty free RTOS.

Monarch SX SoC platform
Monarch SX is highly integrated, eliminating the need to add an external application processor to run primary IoT applications, including voice, music, graphical user interface, sensor data collection, location services, cloud communications, edge analytics, and more. Its component parts, processor, sensor hub, media processing and LTE modem, are all highly optimized for power-efficiency, enabling LTE Cat M1/NB1 LTE IoT applications to run for several years on ultra small batteries, delivering industry-leading price/performance capability.

Applications
Monarch SX is ideal for adding LTE Cat M1 and/or LTE Cat NB1 connectivity to narrowband, low data rate M2M and IoT devices, including asset trackers, wearables, smart utility meters, smart city and smart home sensors and a wide variety of additional industrial and consumer IoT applications.

Key Benefits of Monarch SX
LTE Cat M1/NB1 Platform

Optimized for low cost and low power
Monarch SX leverages more than a dozen years of Sequans’ 4G chip design optimization experience. Its high-level of integration and highly-efficient architecture result in a very cost-effective chipset solution for price-sensitive IoT devices. Monarch SX’s ultra-low power consumption—in PSM (power saving mode), extended DRX, and active modes—is best in class.

Proprietary Dynamic Power Management (DPM) low power technology
Additional low power capability is enabled by Sequans’ proprietary Dynamic Power Management (DPM) technology, which adapts chipset sleep and active state power consumption based on use case to minimize power consumption for all IoT device types, enabling 10-15 year battery life* for some IoT use cases.

Single SKU global LTE band coverage via programmable on chip RF filtering
Monarch SX’s versatile RF architecture supports programmable intelligent RF filtering that greatly simplifies RF front-end complexity, reducing bill-of-materials, cost, and footprint while providing a total solution for the design of single SKU devices supporting global LTE multi-band designs.

Simple software integration into IoT devices
Monarch SX’s comprehensive software development kit is based on more than a dozen years of proven field experience. With certifications and deployments in major LTE networks around the world, it is one of the most mature software solutions in the global 4G ecosystem. It includes the entire LTE Release 13 software stack and other drivers and applications required for a complete LTE system. Integration of customer applications on the ARM Cortex M4 runningRTOS (real time operating system) is simplified thanks to a complete set of libraries for LTE-connected IoT applications. The standard-compliant OMA LWM2M client enables remote management of devices over-the-air. A field diagnostic tool and an RF calibration software tool are provided for faster time-to-market.

Extended coverage
Monarch SX implements the most advanced coverage enhancement techniques to provide superior network coverage and performance. Compared to legacy LTE systems, Monarch SX adds up to 20 dB link budget, thus enabling robust operation in challenging environments, in particular, in-building.
**Product characteristics**

**Baseband Features SQN3340**

**Product Features**
- Single chip FC-CSP package, 9 mm x 9.65 mm, integrates ARM Cortex-M4 processor + media processing units + sensor hub + baseband + RF transceiver + RAM + power management
- Ultra low power CMOS technology
- Single chip FC-CSP package, 9 mm x 9.65 mm.

**LTE Modem**
- Supports narrowband channel sizes defined in 3GPP Release 13 LTE Advanced Pro standard for machine type communications: 1.4 MHz and 200 kHz bandwidths
- Configurable support for LTE UE Cat M1/NB1
- Optimized for single Rx and HD-FDD operation
- Coverage enhancement (mode A and mode B) with frequency hopping and time repetition
- Supports all DL/UL and special sub-frame configurations
- Improved scanning performance for deep indoor coverage
- Standard 3GPP security, integrity, ciphering algorithms
- Intra/inter-frequency handover
- VoLTE
- Supports PSM and extended DRX for long sleep duty cycles

**Interfaces**
- Serial interfaces: USB, high-speed UART, SDIO, I2C, I2S, SPI, serial and parallel display interfaces
- High speed, low power, serial flash interface
- USIM, Secure Element

**RF Transceiver**
- Optimized for half-duplex FDD; also supports FD-FDD and TDD
- Support for programmable RF filtering, enabling simple, single-SKU hardware designs supporting global LTE bands
- Optimized for single Tx/Rx
- Support for single-tone and multi-tone uplink in NB-IoT
- 699 MHz to 2.7 GHz
- Supports normal (+23 dBm) and reduced (+20 dBm) Tx power class option

**System Power Management**
- Single power supply powering embedded voltage converters to simplify device supply tree
- Real time clock and alarm
- Fast wake-up and power saving modes
- Proprietary Dynamic Power Management (DPM) technology optimizes energy efficiency based on traffic patterns and active/sleep duty cycles

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StreamliteLTE is Sequans’ product line for devices for the Internet of Things. StreamliteLTE solutions provide an ideal balance of IoT features and low cost, enabling affordable, mass market, M2M and IoT devices.

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