Boundary Devices
a Laird Connectivity™ company

Nitrogen93

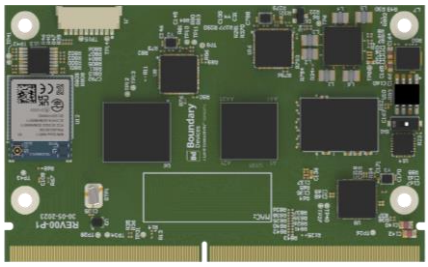
i.MX 93 + Wi-Fi 6 + Bluetooth 5.3
SMARC 2.1.1 Form Factor

Next Generation Secure, Smart, Standardized, and Connected IoT: Powerful NXP Edge Processing with NXP Wi-Fi 6 and Bluetooth 5.3

Featuring **NXP i.MX 93** and Sona NX611 **(NXP IW611)**

Up to 1.7 GHz dual-core Cortex-A55 and **250 MHz Cortex-M33**

Optional dual-band **Wi-Fi 6** (**802.11ax**) and **Bluetooth 5.3**



GOLD PARTNER NXP

Our customers asked for a peripheral rich and robust SoM that simplifies their BOM, has reliable connectivity, uses a standard form factor, and is globally certified. One with multiple software options, a proven security architecture, long term software support, and security fixes.

Our new Nitrogen93 SOM is powered by **NXP's next generation i.MX 93** processor, **NXP PMIC PCA9451A,** and our Sona NX611 WiFi 6 / Bluetooth 5.3 radio based on **NXP's IW611.** It features high performance LPDDR4 RAM, and eMMC storage. We combine this with our common SMARC carrier board; together they serve as a single board computer (SBC) that can speed your product to market. Alternately, work with us to create a custom carrier that fits your mechanical, environmental, temperature, and interface requirements.

- **Powerful Heterogenous Multiprocessing:** Up to 1.7 GHz dual-core Cortex-A55 microprocessor and 250 MHz Cortex-M33 microcontroller allow you to run Linux and an RTOS on dedicated, hardware-firewalled subsystems.
- **Dedicated Machine Learning:** High-performance edge machine learning via an integrated Arm Ethos™-U65 microNPU, delivering up to 2.3 TOPS.
- **Diversity of Interfaces:** Multiple display, network, data, audio and camera interfaces.
- **SMARC 2.1.1 Standard Form Factor: 82mm x 50mm** SMARC edge connector form factor which includes **onboard ethernet PHYs**. One design supports multiple processor, memory, and wireless configurations.
- **Hardware Upgrade Roadmap:** Build a product design that can easily be upgraded to the latest processors and wireless options as future Laird Connectivity SOMs based on the SMARC standard are released.
- **Advanced Common Carrier/Development Board:** Display, camera, audio, Ethernet, USB, CAN, I2C, SPI, UART, and more. Use in development, as an SBC equivalent in a product, or as reference designs for your carrier board design.
- Optional **Wi-Fi 6** (802.11ax) and **Bluetooth 5.3** Classic & Low Energy (LE)
- **Operating Temperate Range**
  - Commercial Rating (0° to +70 °C)
  - Industrial Rating (-40° to +85 °C)
- **Multiple high performance memory options**:
  2GB LPDDR4 / 16GB eMMC
  4GB LPDDR4 / 16GB eMMC
- Extensive range of **pre-certified antennas** for Sona NX611
- **US based manufacturing with Global Options:** Manufacture in USA for local customer base and US market needs. Global manufacturing capability as part of Laird Connectivity footprint, growing reach to EMEA & APAC regions
- **Diverse Software and Board Support Options:** Choose from Yocto Linux/Buildroot Linux/Ubuntu for Cortex-A55s, Zephyr RTOS/FreeRTOS for the Cortex-M33.
- **Secure and Encrypted Boot, Secure Enclave, and Secure File Storage:** Robust, secure, and optionally encrypted boot mechanism to ensure only trusted software boots on your device. Optionally store and use secure keys, certificates, and credentials in run-time isolated trusted environment.
- **Power Efficient:** NXP PMIC, power optimized LPDDR4 and eMMC memory, core shut off, clock/voltage scaling, low power interfaces, power optimized single stream Wi-Fi enable highly optimized power consumption
- **Long term hardware availability and software support:** Laird Connectivity's products are specifically designed to meet the needs of the industrial and medical markets, which typically require 10 year or more product lifecycles. Long-term software support includes LTS Yocto Linux and Zephyr RTOS support with vulnerability remediation.

Features at a Glance

Reliable Connectivity: Optional Wi-Fi 6 and BT 5.3
Excellent Wi-Fi and BT Classic / LE connectivity in difficult environments, plus enterprise Wi-Fi support via WPA3-Enterprise for more secure and robust connections.

ML, Graphics, Vision, Audio, and Industrial Peripherals
1 TOPS Machine Learning NPU, MIPI-DSI, LVDS, or parallel display, MIPI-CSI camera interface, I2S audio interfaces, 2x CAN/CAN-FD, 2x Gbit Ethernet, and more

Secure Enclave and Secure Boot Powered by i.MX 93
Dedicated on-board security hardware, secure boot Linux, and high-performance and flexible secure storage system for passwords, certificates, and data storage.

Robust Software and Speed to Market
Choose from Yocto Linux, Buildroot Linux, and Ubuntu for the Cortex-A55s, Zephyr RTOS and FreeRTOS for the Cortex-M33

Global Radio Approvals
SKUs with Sona IW611 carry several modular FCC, IC, CE, UKCA, RCM, MIC, KC and Bluetooth SIG approvals.

Personal Support From Design to Manufacture
Our industry-renowned support and field application engineering team is passionate about helping you speed your design to market.

Application Areas

- Energy Meters, Energy Storage Smart Electrical Panels
- Smart City, Smart Camera
- Smart Building Control, HVAC
- Industrial Human Machine Interface (HMI)
- Industrial IoT, Vision Systems
- Commercial Food and Beverage Equipment

Interesting in our Nitrogen93 SMARC?
Visit us at **http://www.boundarydevices.com/product/nitrogen-93-smarc**

KEY SPECIFICATIONS

CATEGORY	FEATURE	SPECIFICATION
Processors	Microprocessor	2x Cortex®-A55 cores @ up to 1.7 GHz
	Microcontroller	1x Cortex®-M33 core @ 250 MHz
	Graphics	2D Engine
	Machine Learning	Arm Ethos™-U65 microNPU Neural Processing Unit (NPU) with up to 1 TOP/s
Memory	RAM	2GB and 4GB
	Storage	16GB. *(For custom sizes, please contact Sales)*
Machine Learning	Neural Processing Unit	▪ Keyword detect, noise reduction, beamforming ▪ Speech recognition ▪ Human pose detection and gesture recognition ▪ Image recognition and beautification ▪ Object detection and classification
Graphics and Video	Graphics Engine	▪ 2D Engine
	Display Interfaces	▪ 1x MIPI DSI, up to 1920x1200p60 ▪ 1x LVDS Tx, up to 1366x768p60 or 1280x800p60 ▪ 1x Parallel Display, up to 1366x768p60 or 1280x800p60
Vision	Camera	1x 2-lane MIPI CSI
Audio	Audio Interfaces	2x I2S
Peripherals	Input/Output	▪ 2x USB 2.0 with PHY ▪ 2x Gbit Ethernet with PHY and support for Energy Efficient Ethernet, IEEE® 1588, AVB (One also supports TSN) ▪ 2x CAN/CAN-FD ▪ 4x UART 5 Mbit/s ▪ 5x I2C ▪ 2x SPI ▪ 1x SDIO 3.0/eMMC 5.1 ▪ 14x GPIO
Optional Wireless Specification	Wi-Fi	Wi-Fi 6 (802.11ax)
	Frequency	Dual-Band 2.4GHz & 5GHz
	Bluetooth	Bluetooth 5.3
	Transmit Power	+ 18 dBm (maximum)
	Antenna Options	Onboard shared Wi-Fi/BT, 1 MHF4 connector shared Wi-Fi/BT, or 2 MHF4 separate Wi-Fi and BT
	Raw Data Rates (Air)	Wi-Fi 6 600.5Mbit/s – MCS11, 80MHz, 1024QAM, SGI
Key Wi-Fi Features	Wi-Fi 6 (802.11ax)	▪ IEEE 802.11 a/b/g/n/ac/ax ▪ 20, 40 & 80MHz bandwidth support ▪ OFDMA
Key Bluetooth Features	Bluetooth	▪ Classic Bluetooth – BR / EDR ▪ LE Secure Connections ▪ Central / Peripheral Modes ▪ Up to 16 Bluetooth LE connections ▪ LE Long Range (Coded PHY) ▪ LE isochronous channels
Supply Voltage		5 V
Physical	Dimensions	SMARC 2.1 Standard - 82mm x 50mm
Environmental	Temp Range	0°C to +70°C (Commercial) and -40° to +85 °C (Industrial)
Miscellaneous	Lead Free	Lead-free and RoHS-compliant
	Carrier Board	Carrier board, accessories, and evaluation software
Qualifications	Bluetooth® SIG	Bluetooth SIG Qualified Listing
Regulatory	Approvals	FCC/IC/CE/MIC/RCM/KCC

For full specifications on the Nitrogen93, please see the appropriate datasheet.

Part # (Tentative)	Description
N93_SMARC_SOM_1r16e	Nitrogen93 SMARC SOM: i.MX 93 Dual / 1GB / 16GB eMMC / 0 to +70°C / Without Wireless
N93_SMARC_SOM_2r16e	Nitrogen93 SMARC SOM: i.MX 93 Dual / 2GB / 16GB eMMC / 0 to +70°C / Without Wireless
N93_SMARC_SOM_1r16e_i	Nitrogen93 SMARC SOM: i.MX 93 Dual / 2GB / 16GB eMMC / -40 to +85°C / Without Wireless
N93_SMARC_SOM_2r16e_i	Nitrogen93 SMARC SOM: i.MX 93 Dual / 2GB / 16GB eMMC / -40 to +85°C / Without Wireless
SMARC_CAR_BRD	Universal Carrier Board - SMARC (Note - SOM sold separately)

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