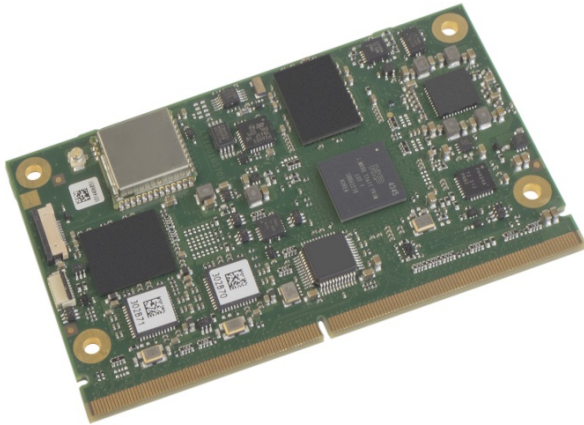


## MSC SM2S-IMX93

NXP<sup>®</sup> i.MX 93 Arm<sup>®</sup>  
Cortex<sup>®</sup>-A55 / M33



82 x 50 mm



2-4 W



-40 +85



## Description

The MSC SM2S-IMX93 SMARC 2.1.1 module family is highly scalable and equipped with i.MX 93 Applications Processors manufactured by NXP. The processors integrate Arm Cortex-A55 cores, bringing performance and energy efficiency to Linux-based edge applications and the Arm Ethos-U65 microNPU, enabling developers to create more capable, cost-effective and energy-efficient machine learning (ML) applications. The i.MX 93 processors deliver advanced security with integrated EdgeLock secure enclave and an efficient pixel pipeline to perform 2D graphics processing to realize cost-effective GUI solutions.

The MSC SM2S-IMX93 provides fast and low power LPDDR4 memory technology with inline ECC support, combined with up to 256GB eMMC Flash memory. Various interfaces for embedded applications such as Dual Gigabit Ethernet, USB 2.0, CAN-FD, single-channel LVDS or MIPI DSI and MIPI CSI for connecting a camera are available. An on-board Wireless Module is provided as assembly options. The typical design power ranges from 2 W to 4 W.

The module is compliant with the new SMARC 2.1.1 standard, allowing easy integration with SMARC baseboards. For evaluation and design-in of the SM2S-IMX93 module, Avnet Embedded provides a development platform and a starter kit. Support for Linux is available (Android support available on request).

## Highlights

- Single or Dual core Arm Cortex-A55 Applications Processors up to 1.7GHz
- Arm Cortex-M33 Real Time Processor at 250MHz
- Arm Ethos™-U65 microNPU with 256 MACs/Cycle
- Pixel processing pipeline (PXP) engine
- Up to 2GB LPDDR4 SDRAM with inline ECC
- Up to 256GB eMMC Flash
- Single-channel LVDS / MIPI-DSI x4 (optional)
- MIPI CSI-2 Camera Interface
- 4x USB 2.0 Host interfaces
- 1x USB 2.0 Host/Device interface
- 2x Gigabit Ethernet
- Wireless Module (optional)
- 1x MMC/SD/SDIO interface
- 2x CAN-FD interfaces
- 2x I2S Audio interfaces
- 14x GPIO
- UART, SPI, I2C
- SMARC 2.1.1 Compliant
- Energy Flex Architecture
- Optimized design for low power applications

## Technical Data - MSC SM2S-IMX93

<b>Technology</b>	Arm
<b>Formfactor</b>	SMARC Short Size
<b>CPU</b>	<p>NXP i.MX 93 Arm Cortex-A55 Applications Processors</p> <ul style="list-style-type: none"> <li>- i.MX 9352, dual-core, NPU, 1.5 - 1.7GHz</li> <li>- i.MX 9332, dual-core, 1.5 - 1.7GHz</li> <li>- i.MX 9351, single-core, NPU, 1.5 - 1.7GHz</li> <li>- i.MX 9331, single-core, 1.5 - 1.7GHz</li> </ul> <p>Arm Cortex-M33 Real Time Processor at 250MHz</p> <p>Arm Ethos-U65 microNPU with 256 MACs/Cycle</p>
<b>Chipset</b>	SOC
<b>RAM</b>	Up to 2GB 3700MT/s LPDDR4 SDRAM, soldered, inline ECC support
<b>Flash</b>	Up to 256GB eMMC Flash
<b>Storage Interfaces</b>	1x MMC/SD/SDIO
<b>USB</b>	1x USB 2.0 Host/Client, 4x USB 2.0 Host or 1x USB 2.0 Host/Client, 1x USB 2.0 Host (optional)
<b>Serial Interfaces</b>	2x UART with 2-wire hand shake 2x UART w/o hand shake
<b>Bus Interfaces</b>	4x I2C up to 400 Kbit/s 2x CAN-FD / CAN 2.0B 2x SPI (with two chip selects)
<b>Display Controller</b>	<p>Pixel processing pipeline (PXP) engine to support 2D image processing (i.e. Blending/Composition, Rotation, Resize, Color Space Conversion)</p> <p>no 3D Graphics Processing Unit (GPU) no Video Processing Unit (VPU)</p>
<b>Display Interfaces</b>	Single-channel LVDS interface, 18 or 24 bit, up to 1366x768 @ 60fps or MIPI-DSI Display Interface, 4 lanes, up to 1920x1080 @ 60fps (optional)
<b>Network Interface</b>	<p>2x 10/100/1000BASE-T Ethernet (one interface with TSN/1588 support)</p> <p>HD Wireless Module SPB209A with 802.11ac / Bluetooth 5.0, soldered (optional)</p>
<b>Audio Interface</b>	1x I2S Audio
<b>Security Device</b>	<p>Advanced Security, Safety, and Reliability integrated in the SOC</p> <p>Integrated EdgeLock secure enclave enables autonomous management of security functions, including runtime attestation, silicon root of trust, reusable certifications, trust provisioning, and fine-grain key management augmented by extensive crypto services for advanced attack resistance</p> <p>Trusted Platform Module (TPM) 2.0 (optional)</p>

<b>Miscellaneous</b>	<p>Watchdog Timer for system reset (programmable, 1s ... 600s)</p> <p>RTC / temperature compensated (optional)</p> <p>14x GPIO, configurable as input or output, interrupt capable</p> <p>64kbit ID EEPROM on I2C bus</p> <p>MIPI CSI-2 camera interface (CSI0, 2-lane) or MIPI CSI-2 camera interface (CSI1, 2-lane)</p>
<b>Feature Highlights</b>	SMARC 2.1.1 compatible
<b>Firmware</b>	uboot
<b>OS Support</b>	<p>Linux Board Support Package</p> <p>Android Board Support Package (on request)</p>
<b>Power Requirement</b>	<p>Power Supply +5V +/-5%, 5V Standby</p> <p>Power Consumption 2-4 W typ. (depending on CPU and optional features)</p>
<b>Environment</b>	<p>Temperature Range:</p> <p>Commercial: 0° ... 70°C (operating) -20° ... 85°C (storage)</p> <p>Extended: -25° ... 85°C (operating) -40° ... 85°C (storage)</p> <p>Industrial: -40° ... 85°C (operating) -40° ... 85°C (storage)</p> <p>Humidity:</p> <p>5 ... 95% (operating, non-condensing)</p> <p>5 ... 95% (storage, non-condensing)</p>
<b>Dimensions</b>	82 x 50 mm
<b>Certificates</b>	UL / CE
<b>Cooling</b>	Heatspreader
<b>Carrier</b>	<p>MSC SM2-MB-EP1</p> <p>MSC SM2-MB-EP5</p>

## Order Reference - MSC SM2S-IMX93

Order Number	Description	Reference	Cat*
111291	SMARC module based on NXP i.MX 9352, Dual Core Cortex-A55 at 1.5GHz, NPU, 2GB LPDDR4, 32GB eMMC Flash, 2x GbE LAN, 4x USB2.0 Host, 1x USB2.0 Host/Device, BT/WLAN, LVDS, MIPI CSI-2 Camera input (CSI0, 2 lane); industrial temperature -40...+85°C	MSC SM2S-IMX93-DC-15N02E1I PCBFTX	PV
111289	SMARC module based on NXP i.MX 9352, Dual Core Cortex-A55 at 1.5GHz, NPU, 2GB LPDDR4, 16GB eMMC Flash, 2x GbE LAN, 4x USB2.0 Host, 1x USB2.0 Host/Device, MIPI DSI, MIPI CSI-2 Camera input (CSI0, 2 lane); industrial temperature -40...+85°C	MSC SM2S-IMX93-DC-14N08A0I PCBFTX	PV
111365	SMARC module based on NXP i.MX 9332, Dual Core Cortex-A55 at 1.5GHz, no NPU, 2GB LPDDR4, 16GB eMMC Flash, 2x GbE LAN, 4x USB2.0 Host, 1x USB2.0 Host/Device, LVDS, MIPI CSI-2 Camera input (CSI0, 2 lane); industrial temperature -40...+85°C	MSC SM2S-IMX93-DCL-14N02A0I PCBFTX	PV
111363	SMARC module based on NXP i.MX 9332, Dual Core Cortex-A55 at 1.5GHz, no NPU, 1GB LPDDR4, 16GB eMMC Flash, 2x GbE LAN, 1x USB2.0 Host, 1x USB2.0 Host/Device, LVDS, MIPI CSI-2 Camera input (CSI0, 2 lane); extended temperature -25...+85°C	MSC SM2S-IMX93-DCL-04N02B0E PCBFTX	PV
111367	SMARC module based on NXP i.MX 9331, Single Core Cortex-A55 at 1.5 GHz, no NPU, 1GB LPDDR4, 8GB eMMC Flash, 1x GbE LAN, 1x USB2.0 Host, 1x USB2.0 Host/Device, LVDS, MIPI CSI-2 Camera input (CSI0, 2 lane); extended temperature -25...+85°C	MSC SM2S-IMX93-SCL-03N0270E PCBFTX	PV

\*COM products are divided in two categories, „PV“ (preferred variant) and „OR“ (on request).

Accessories

Order Number	Description	Reference
Carrier Options		
68488	SMARC 2.0 Embedded Platform with PCI Express x4 slot, GbE, SATA, USB 3.0, USB 2.0, USB 2.0 OTG, RS232, CAN, SPI, eSPI, SMBus, I2C and GPIO interface, LVDS/eDP, DisplayPort and HDMI display interface, regulated backlight supply, HD/I2S audio interface, MIPI CSI-2 camera interface, mini PCI Express card slot, SD card slot, fan connector, CMOS battery, Mini-ITX form factor (170 x 170 mm), ATX power connector and single 12V/24V power jack, commercial temperature range 0..+70°C	MSC SM2-MB-EP1-001 PCBFTX
83977	SMARC 2.x compatible embedded platform (146 x 80mm), 10-36V input voltage, 3x RS232, 2x CAN, dual RJ45 LAN with LED (1 x LAN i210) , 1x M.2 2280 Key M slot, mPCIe slot, 1x USB 3.0 Type A, 1x USB 2.0 Type A, 1x USB 2.0 internal, 1x USB 2.0 Host/Device, 2x SPI, I²C, 8 GPIO on FC, 1x HDMI, LVDS/eDP/DSI on J1LI30 connector, SD Card Slot, regulated backlight supply, I2S Audio, 1W Mono, camera connector, RTC battery. Industrial temperature range -40..+85°C, ARM full version	MSC SM2S-MB-EP5-002 PCBFTX
83981	SMARC 2.x compatible embedded platform (146 x 80mm), 10-36V input voltage, 2x UART, 1x RS232, 2x CAN, 1x RJ45 LAN with LED, 1x USB 2.0 Type A, 1x USB3.0 Type A, 1x USB 2.0 internal, 1x USB 2.0 Host/Device, 2x SPI, 12 GPIO on FC, 1x HDMI , SD Card Slot, LVDS/eDP/DSI on J1LI30 connector, regulated backlight supply, RTC battery. Industrial temperature range -40..+85°C, ARM slim version	MSC SM2S-MB-EP5-004 PCBFTX
Cooling Options		
97153	Heatspreader for SM2S-IMX93 module, consisting of a single-piece aluminum plane and thermal pad for contact to the processor, with 2.7mm through-hole standoffs	MSC SM2S-IMX93-01 HSP-001
Other Accessories		
82479	Debug Console (UART) Adapter for i.MX6-based Qseven and nanoRISC modules, with 8-pin FFC cable to connect COM module to 9-pin D-Sub connector	MSC Debug Console Adapter
68948	Debug Adapter for i.MX6-based Qseven, SMARC and nanoRISC modules, with 10-pin FFC cable to connect to COM module, adapter provides headers for JTAG connection to Lauterbach and/or Goepel debuggers	MSC JTAG Adapter FFC 10-pin
Starter Kits		
97502	SMARC 2.0 Starterkit for NXP i.MX 9 based Modules. Includes MSC SM2-MB-EP1 Baseboard, Heatspreader/Heatsink, SD Card with USB Card Reader, Power Supply and suitable cable kit. The StarterKit does not include the MSC SM2S-IMX93 or SM2S-IMX91 module. Please order your choice of module separately.	MSC SM2-SK-IMX9-EP1-KIT001 BRDFTX

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