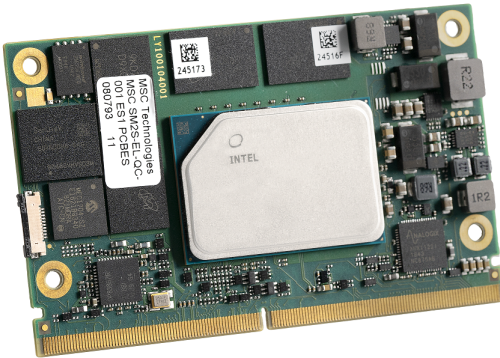





## MSC SM2S-EL

Intel® Atom™ x6000 /  
Pentium® / Celeron® N and J  
Series SOC



-  82 x 50 mm
-  6 / 12 W
-  -40 +85 °C



## Description

The new MSC SM2S-EL module features Intel's next-generation low-power, multi-core system-on-chip (SOC) Atom generation (codenamed "Elkhart Lake"). Built on 10nm process technology the SoC integrates the next generation Intel Atom processor core architecture and graphics accelerators, memory controller and rich I/O functionality into a single package. The module is designed for extended temperature range and 24/7 operation making it an ideal platform for mission critical tasks that require a reliable and performant compute base. It provides significant performance gains over previous Atom generations allowing for technology upgrades within existing power and cooling requirements defined by the system design.

The new MSC SM2S-EL offers triple independent display support with a maximum of 4k resolution, DirectX 12, fast LPDDR4x memory with up to 16GB and optional IB ECC capabilities, eMMC 5.1, USB 3.1 and PCIe Gen3 on a power saving and cost-efficient SMARC 2.1.1 module.

Different SOC's with dual- and quad-core processors are supported by this design. In addition to an extensive set of interfaces and features, the MSC SM2S-EL offers 2 Gigabit Ethernet with Time-Sensitive Networking (TSN) and 2 CAN-FD interfaces.

For evaluation and design-in of the MSC SM2S-EL module, Avnet Embedded provides a suitable SMARC 2.1.1 development platform. A complete, ready-to-run Starterkit is also available.

## Highlights

- Intel Atom x6xxxRE, Real-time Embedded SKU's, dual/quad-core (6W-12W)
- Intel Atom x6xxxE, Embedded SKU's, dual/quad-core (6W-12W)
- Intel Pentium/Celeron J64xx, PC Client SKU's, quad-core (6W-12W)
- Intel Pentium/Celeron N6xxx, PC Client SKU's, dual/quad-core (6W-12W)
- Integrated Intel UHD Graphics (Gen11)
- Up to 16GB LPDDR4x SDRAM with IB ECC (only Atom SKU's)
- Up to 256GB eMMC 5.1 Flash (optional)
- SATA-III interface (6Gbps)
- 2x DP++
- LVDS / Embedded DisplayPort and MIPI-DSI
- Triple Independent Display support
- DirectX, OpenGL 4.5, OpenCL 1.2, Vulkan v1.1
- Up to 4x PCI Express x1/x2/x4 Gen. 3
- 2x USB 3.1 Host interfaces (1x Host/Device)
- 6x USB 2.0 Host interfaces (1x Host/Device)
- 2x Gigabit Ethernet with TSN/TCC
- 1x SGMII Interface on PCIE-D (optional)
- UART, SPI, I2C, SMBus
- 2x CAN-FD
- HD/I2S Audio, SD Card interface
- Trusted Platform Module (optional)
- SMARC 2.1.1 compliant
- UEFI Firmware

## Technical Data - MSC SM2S-EL

<b>Technology</b>	x86
<b>Formfactor</b>	SMARC™ 2.1.1 Short Size
<b>CPU</b>	<p>Intel Atom x6425RE Processor, quad-core, 1.9GHz, 32EU, TCC, IBECC, 12W, IUC            Intel Atom x6416RE Processor, quad-core, 1.7GHz, 16EU, TCC, IBECC, 9W, IUC            Intel Atom x6414RE Processor, quad-core, 1.5GHz, 16EU, TCC, IBECC, 9W, IUC            Intel Atom x6214RE Processor, dual-core, 1.4GHz, 16EU, TCC, IBECC, 6W, IUC            Intel Atom x6212RE Processor, dual-core, 1.2GHz, 16EU, TCC, IBECC, 6W, IUC            Intel Atom x6425E Processor, quad-core, 2.0/3.0GHz, 32EU, IBECC, 12W, EUC            Intel Atom x6413E Processor, quad-core, 1.5/3.0GHz, 16EU, IBECC, 9W, EUC            Intel Atom x6211E Processor, dual-core, 1.3/3.0GHz, 16EU, IBECC, 6W, EUC            Intel Pentium J6426 Processor, quad-core, 2.0/3.0GHz, 32EU, 10W, PUC            Intel Pentium N6415 Processor, quad-core, 1.2/3.0GHz, 16EU, 6.5W, PUC            Intel Celeron J6413 Processor, quad-core, 1.8/3.0GHz, 16EU, 10W, PUC            Intel Celeron N6211 Processor, quad-core, 1.2/3.0GHz, 16EU, 6.5W, PUC</p> <p>Intel® Technologies:            Enhanced Intel® SpeedStep® Technology            Intel® Virtualization Technology (VTx-2, VT-d)            Intel® Trusted Execution Engine (TXE)            Intel® Time Coordinated Computing (TCC)            Precision Time Measurement (PTM)            Precision Time Measurement (PTP)</p> <p>IUC - Intel Industrial Use Conditions            EUC - Intel Embedded Use Conditions            PUC - Intel PC Client Use Conditions</p>
<b>Chipset</b>	Integrated in SOC
<b>RAM</b>	Up to 16GB LPDDR4x SDRAM, up to 4267MT/s, IBECC (only Atom SKU's), soldered
<b>Flash</b>	Up to 256GB eMMC V5.1 Flash, soldered (optional)
<b>Storage Interfaces</b>	1x SATA-III 6Gbps 1x SD 3.01/SDIO 3.0
<b>USB</b>	2x USB 3.1 Host interfaces (1x Host/Device) 6x USB 2.0 Host interfaces (1x Host/Device)
<b>Serial Interfaces</b>	4x UART (two with handshake)
<b>Bus Interfaces</b>	Up to 4x PCI-Express x1 Gen. 3 lanes 1x I2C Bus 1x SPI Bus (Boot) 1x SPI Bus (general purpose)/ eSPI (optional) 1x SMBus 2x CAN-FD (Flexible Data-Rate)
<b>Display Controller</b>	Integrated Intel UHD Graphics (Gen11) Up to 32 execution units (EU) 3D Acceleration: DirectX, OpenGL 4.5, OpenCL 1.2, Vulkan 1.0 Video Decode: MPEG-2, H.265/HEVC (L5.1), H.264, (L5.2), VC-1, WMV9, VP8, VP9, MVC, JPEG/MJPEG

<b>Display Interfaces</b>	Three independent displays supported 2x DP++ Dual-Channel LVDS 24/18 bit up to 1920 x 1200 @ 60Hz or Embedded DisplayPort 1.3 up to 4096 x 2160 @ 60Hz and MIPI-DSI x4 Interface up to 4096 x 2160 @ 60Hz (optional)
<b>Network Interface</b>	2x 10/100/1000Base-T 1x SGMII Interface on PCIE-D (optional)
<b>Audio Interface</b>	High Definition Audio and I2S Audio or 2x I2S Audio
<b>Security Device</b>	Infineon Trusted Platform Module 2.0 (optional)
<b>Miscellaneous</b>	Watchdog Timer: Initiates system reset, (programmable, 1s ... 255h) Fan Supply: PWM Speed Control for system fan on carrier board RTC battery: external System Monitoring: Voltage, Temperature, CPU Fan, System Fan
<b>Feature Highlights</b>	SMARC™ 2.1.1 compliant
<b>Firmware</b>	AMI Aptio UEFI
<b>OS Support</b>	Windows 10 IoT Enterprise RS5 (64bit) Linux (Yocto Project)
<b>Power Requirement</b>	+5V +/-5% +5V Standby
<b>Environment</b>	Temperature Range: Commercial: 0° ... 60°C (operating)    -20° ... 85°C (storage) Extended: -25° ... 85°C (operating)    -40° ... 85°C (storage) Industrial: -40° ... 85°C (operating)    -40° ... 85°C (storage)  Humidity: 5 ... 95% (operating, non-condensing) 5 ... 95% (storage, non-condensing)
<b>Dimensions</b>	82 x 50 mm
<b>Certificates</b>	UL / CE
<b>Cooling</b>	Heatspreader Heatsink
<b>Carrier</b>	MSC SM2-MB-EP1

## Order Reference - MSC SM2S-EL

Order Number	Description	Reference	Cat
87436	SMARC 2.1.1 module with Intel Atom x6425RE, Quad-Core (1.9GHz), 12W, 4GB LPDDR4x (3733 MT/s) IB ECC, 32EU, TCC, 4GB eMMC, 2x GbE LAN, SGMII on PCIe_D, no SATA, 2x USB 3.1 (1x Host/Device), 6x USB 2.0 (1x Host/Device), 2x DP++, TPM 2.0, eDP, IUC (Industrial use conditions), extended temperature -25°C...+85°C	MSC SM2S-EL-x6425RE-22N0191E PCBFTX	OR
88129	SMARC 2.1.1 module with Intel Atom x6425RE, Quad-Core (1.9GHz), 12W, 16GB LPDDR4x (3200 MT/s) IB ECC, 32EU, TCC, 64GB eMMC, 2x GbE LAN, 1x SATA, 2xUSB 3.1 (1x Host/Device), 6x USB 2.0 (1x Host/Device), TPM 2.0, LVDS, IUC (Industrial use conditions), industrial temperature -40...+85°C	MSC SM2S-EL-x6425RE-46N0281I PCBFTX	PV
88125	SMARC 2.1.1 module with Intel Atom x6414RE, Quad-Core (1.5GHz), 9W, 4GB LPDDR4x (3733 MT/s) IB ECC, 16EU, TCC, 32GB eMMC, 2x GbE LAN, SGMII on PCIe_D, no SATA, 2x USB 3.1 (1x Host/Device), 6x USB 2.0 (1x Host/Device), TPM 2.0, LVDS, IUC (Industrial use conditions), industrial temperature -40...+85°C	MSC SM2S-EL-x6414RE-25N0291I PCBFTX	PV
88121	SMARC 2.1.1 module with Intel Atom x6212RE, Dual-Core (1.2GHz), 6W, 4GB LPDDR4x (3733 MT/s) IB ECC, 16EU, TCC, 16GB eMMC, 2x GbE LAN, 1x SATA, 2x USB 3.1 (1x Host/Device), 6x USB 2.0 (1x Host/Device), TPM 2.0, LVDS, IUC (Industrial use conditions), industrial temperature -40...+85°C	MSC SM2S-EL-x6212RE-24N0281I PCBFTX	PV
88127	SMARC 2.1.1 module with Intel Atom x6425E, Quad-Core (2.0GHz/3.0GHz), 12W, 16GB LPDDR4x (3200 MT/s), IB ECC, 32EU, 64GB eMMC, 2x GbE LAN, 1x SATA, 2x USB 3.1 (1x Host/Device), 6x USB 2.0 (1x Host/Device), TPM 2.0, LVDS, EUC (Embedded use conditions), extended temperature -25°C...+85°C	MSC SM2S-EL-x6425E-46N0281E PCBFTX	PV
88123	SMARC 2.1.1 module with Intel Atom x6413E, Quad-Core (1.5GHz/3.0GHz), 9W, 8GB LPDDR4x (3733 MT/s), IB ECC, 16EU, 32GB eMMC, 2x GbE LAN, SGMII on PCIe_D, no SATA, 2x USB 3.1 (1x Host/Device), 6x USB 2.0 (1x Host/Device), TPM 2.0, LVDS, EUC (Embedded use conditions), extended temperature -25°C...+85°C	MSC SM2S-EL-x6413E-35N0291E PCBFTX	PV
88119	SMARC 2.1.1 module with Intel Atom x6211E, Dual-Core (1.3GHz/3.0GHz), 6W, 4GB LPDDR4x (3733 MT/s), IB ECC, 16EU, 16GB eMMC, 2x GbE LAN, 1x SATA, 2x USB 3.1 (1x Host/Device), 6x USB 2.0 (1x Host/Device), TPM 2.0, LVDS, EUC (Embedded use conditions), extended temperature -25°C...+85°C	MSC SM2S-EL-x6211E-24N0281E PCBFTX	PV
88116	SMARC 2.1.1 module with Intel Pentium J6426, Quad-Core (2.0GHz/3.0GHz), 10W, 16GB LPDDR4x (3200 MT/s), 32EU, 64GB eMMC, 2x GbE LAN, 1x SATA, 2x USB 3.1 (1x Host/Device), 6x USB 2.0 (1x Host/Device), TPM 2.0, LVDS, PUC (PC Client use conditions), standard temperature 0...+60°C	MSC SM2S-EL-J6426-46N0281C PCBFTX	PV

**Order Reference - MSC SM2S-EL**

Order Number	Description	Reference	Cat
88114	SMARC 2.1.1 module with Intel Celeron J6413, Quad-Core (1.8GHz/3.0GHz), 10W, 8GB LPDDR4x (3733 MT/s), 16EU, 16GB eMMC, 2x GbE LAN, 1x SATA, 2x USB 3.1 (1x Host/Device), 6x USB 2.0 (1x Host/Device), TPM 2.0, LVDS, PUC (PC Client use conditions), standard temperature 0...+60°C	MSC SM2S-EL-J6413-34N0281C PCBFTX	PV
90305	SMARC 2.1.1 module with Intel Atom x6414RE, Quad-Core (1.5GHz), 9W, 4GB LPDDR4x (3733 MT/s) IB ECC, 32EU, TCC, 4GB eMMC, 2x GbE LAN, SGMII on PCIe_D, no SATA, 2x USB 3.1 (1x Host/Device), 6x USB 2.0 (1x Host/Device), 2x DP++, TPM 2.0, eDP, IUC (Industrial use conditions), extended temperature -25°C...+85°C	MSC SM2S-EL-x6414RE-22N0191E PCBFTX	PV
96349	SMARC 2.1.1 module with Intel Atom x6413E, Quad-Core (1.5GHz/3.0GHz), 9W, 4GB LPDDR4x (3733 MT/s), IB ECC, 16EU, 128GB eMMC, 2x GbE LAN, 1x SATA, 2x USB 3.1 (1x Host/Device), 6x USB 2.0 (1x Host/Device), TPM 2.0, LVDS, EUC (Embedded use conditions), industrial temperature -40...+85°C	MSC SM2S-EL-x6413E-27N0281I PCBFTX	PV
110394	SMARC 2.1.1 module with Intel Atom x6413E, Quad-Core (1.5GHz/3.0GHz), 9W, 4GB LPDDR4x (3733 MT/s), IB ECC, 16EU, 32GB eMMC, 2x GbE LAN, 1x SATA, 2x USB 3.1 (1x Host/Device), 6x USB 2.0 (1x Host/Device), TPM 2.0, LVDS, EUC (Embedded use conditions), industrial temperature -40...+85°C	MSC SM2S-EL-x6413E-25N0180I PCBFTX	PV
111756	SMARC 2.1.1 module with Intel Atom x6425E, Quad-Core (2.0GHz/3.0GHz), 12W, 16GB LPDDR4x (3200 MT/s), IB ECC, 32EU, no eMMC, 2x GbE LAN, 1x SATA, 2x USB 3.1 (1x Host/Device), 6x USB 2.0 (1x Host/Device), TPM 2.0, LVDS, EUC (Embedded use conditions), extended temperature -25...+85°C	MSC SM2S-EL-x6425E-4NN0281E PCBFTX	PV
111991	SMARC 2.1.1 module with Intel Atom x6414RE, quad-core (1.5GHz), 9W, 8GB LPDDR4x (3733 MT/s) IB ECC, 16EU, TCC, no eMMC, 2x GbE LAN, 1x SATA, 2x USB 3.1 (1x Host/Device), 6x USB 2.0 (1x Host/Device), LVDS, TPM 2.0, IUC (Industrial use conditions), industrial temperature -40...+85°C	MSC SM2S-EL-x6414RE-3NN0281I PCBFTX	PV

**Accessories**

Order Number	Description	Reference
<b>Carrier Options</b>		
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
85087	SMARC 2.x compatible embedded platform (146 x 80mm), 10-36V input voltage, 3x RS232, 1x RS485, 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 3.0/DisplayPort Type C , 1x USB 2.0 Type A, 1x USB 2.0 internal, 1x USB 2.0 Host/Device, 2x SPI, I <sup>2</sup> C, 12 GPIO on FC, 1x DisplayPort++ , LVDS/eDP/DSI on JILI30 connector, SD Card Slot, regulated backlight supply, HD Audio with amplifier, system fan connector, camera connector, RTC battery. Industrial temperature range -40..+85°C, x86 full version	MSC SM2S-MB-EP5-001 PCBFTX
83979	SMARC 2.x compatible embedded platform (146 x 80mm), 12V input voltage, 3x RS232, 1x RS485, dual RJ45 LAN with LED, 1x M.2 2280 Key M slot , 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 DisplayPort++ , LVDS/eDP/DSI on JILI30 connector, regulated backlight supply, RTC battery, Industrial temperature range -40..+85°C, x86 slim version	MSC SM2S-MB-EP5-003 PCBFTX
<b>Cooling Options</b>		
82414	Passive Heatsink for SM2S-EL variants with Atom processor, consisting of a single-piece aluminium pin cooler and thermal pad for contact to the processor, with 2.7mm through-hole standoffs	MSC SM2S-EL-01 HSI-001
85122	Heatspreader for SM2S-EL variants with Atom processor, consisting of a single-piece aluminium plane and thermal pad for contact to the processor, with 2.7mm through-hole standoffs	MSC SM2S-EL-01 HSP-001
88512	Passive Heatsink for SM2S-EL variants with Pentium/Celeron processor, consisting of a single-piece aluminium pin cooler and thermal pad for contact to the processor, with 2.7mm through-hole standoffs	MSC SM2S-EL-02 HSI-001
88511	Heatspreader for SM2S-EL variants with Pentium/Celeron processor, consisting of a single-piece aluminium plane and thermal pad for contact to the processor, with 2.7mm through-hole standoffs	MSC SM2S-EL-02 HSP-001

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