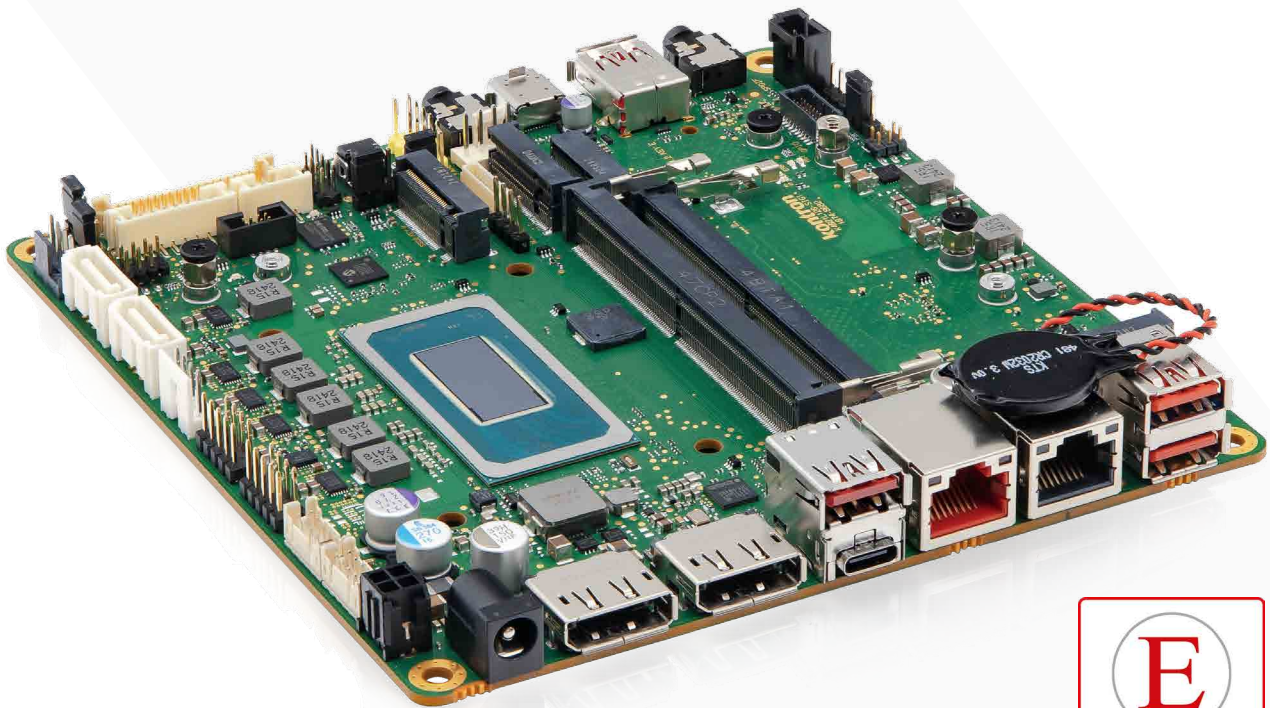


K4021-U mSTX

Industrial Series



Intel® Core™ Ultra 7 & 5 Processors Meteor Lake U

- › Latest DDR5 memory technology for best-in-class system performance
- › Intel® Graphics - driven by Intel® X^e architecture (within SoC)
- › Up to four concurrent 4K60 HDR displays or two 8K displays
- › Dual Channel LVDS (24 Bit) and eDP V1.4b (4K) onboard
- › New integrated NPU for dedicated AI acceleration with up to 20x performance/watt improvement

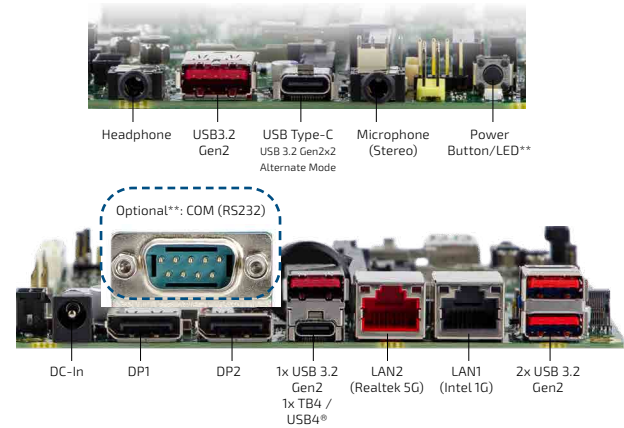
K4021-U mSTX Industrial Series

The K4021-U mSTX Industrial Motherboard is a compact, high-performance platform engineered for demanding embedded and industrial applications. Powered by the latest Intel® Core™ Ultra Processor series, it delivers exceptional computing performance and advanced Intel® UHD Graphics Gen12 based on the Xe architecture. With support for up to four independent 4K displays or dual 8K outputs, the K4021-U offers outstanding visual capabilities through a versatile mix of DisplayPort™, USB Type-C with TB4*/USB4®, embedded DisplayPort™ and dual-channel 24-bit LVDS interfaces.

- Intel® Core™ Ultra Processors
- DDR5-5600 SODIMM, max 96 GByte
- Intel® Graphics @ MTL-U, Xe LPG (within SoC)
- 2x DisplayPort™ V1.4a
- 1x USB Type-C with DP Alt mode / USB3.2 Gen2x2
- 1x USB Type-C with TB4* / USB4® Support
- Dual Channel LVDS (24 bit) and eDP V1.4b
- 8 Bit GPIO & HD Audio onboard
- 4x USB3.2 Gen2
- 1x Intel® i219LM (with iAMT support) GbE LAN,
- 1x Realtek RTL8126 5GbE incl. Teaming
- 2x SATA 6G
- 2x M.2 Key M x4 Gen4
- 1x M.2 Key B
- 1x M.2 Key E (WLAN)
- Intel® integrated iTPM V2.0
- 2x RS-232 support onboard

Designed for flexibility and scalability, the board features four M.2 slots for storage and wireless connectivity, along with a rich set of I/O options including GPIO, dual COM ports, USB 3.2 Gen2 and TB4*/USB4™. Built for 24/7 continuous operation and validated for enhanced temperature ranges up to 60 °C, the K4021-U is ideally suited for a wide range of vertical markets—from industrial automation to digital signage and medical systems.

- HW Watchdog onboard
- WideRange internal/external DC input 9-24V
- PowerDelivery Sink Mode (20V DC-In via Rear USB-C)



*) Thunderbolt™ 4 certification ongoing
 **) Prepared for SMARTCASE™ 5502 chassis kit
 ***) Via optional COM port cable. Breakout feature SC5xx chassis rear I/O

Technical Information

SYSTEM	PROCESSOR	Intel® Core™ Ultra 7 155U Intel® Core™ Ultra 5 125U Intel® NPUs* integrated (up to 11 TOPS), Intel® GNA 3.5 DDR5 5600 SDRAM 2x SO DIMM socket, up to 96 GByte memory, non-ECC
VIDEO	AI CO-PROCESSOR MEMORY	
	GRAPHICS	Intel® Graphics driven by Intel® Xe with up to 8 Xe-cores 1x TB4***/USB4® (DP2.1 up to UHBR20 8K) 2x DP V1.4a up to 8K 1x USB-C with DPoC** 1x eDP V1.4b up to 5K, 1x Dual-Channel 24bit LVDS 1x Dual-Channel 24bit LVDS Supports 4 simultaneous 4K encode streams
AUDIO	AUDIO CODEC AUDIO INTERFACE	Realtek ALC256 Stereo, High Definition Audio Codec
NETWORK CONNECTION	ETHERNET 1	Intel® i219LM with 10/100/1000 MBit/s, Wake-on-LAN (WoL) by interesting Packets, Link Status Change and Magic Packet™, PXE Support, BIOS MAC Address Display, Teaming Support
	ETHERNET 2	Realtek RTL8126 with 10/100/1000/2500/5000 MBit/s, TSN Support, Wake-on-LAN (WoL) by interesting Packets, Link Status Change and Magic Packet™, PXE Support, BIOS MAC Address Display, Teaming Support
PERIPHERAL CONNECTION	USB	4x USB 2.0 (by headers) 1x USB-C 3.2 Gen2x2 + 1x USB-C with TB4***/USB4® support 4x USB3.2 Gen2 Type A 2x RS232 (by headers) 8 Bit GPIO (by header); WLAN LED support, WLAN enable/disable support 3.3 V/5 V/12 V supply voltage output
	SERIAL PORT OTHER I/Os	

*) Neural Processing Unit: Dedicated Low Power AI Engine, integrated in Intel CPU

**) DPoC: DisplayPort over USB-Type-C (Alternate Mode)

***) Thunderbolt™ 4 certification ongoing

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STORAGE & EXPANSION	SATA PCIe/M.2 SLOTS	2x Serial ATA III 600 Interface (up to 6Gbit/s), NCQ, AHCI, 1x M.2 2230/2242/2280 (Key-M, PCIe x4/Gen4/NVMe SSD modules) 1x M.2 2230/2242 (Key-M, PCIe x4/Gen4/NVMe SSD modules) 1x M.2 2242 (Key-B PCIe x2/USB2) 1x M.2 2230 (Key-E, WLAN/Bluetooth modules, PCIe/USB/CNVio)
POWER	CONNECTOR INPUT VOLTAGE OUTPUT VOLTAGE	External/Internal DC-In (DC Jack/4-Pin Micro-Fit) DC Input 9-24V, max. 5A/100W (external DC-In), max. 10A/120W (internal DC-In) USB-C Power Delivery (Sink, 20V, max. 100 W) USB-C Power Delivery 15W (5V, max. 3A)
FIRMWARE	BIOS	AMI Aptio 5.x (UEFI) BIOS modified and adapted by Kontron; Recovery BIOS, SM-BIOS (DMI), BIOS and CPU Microcode Update, Quick Boot, Logo Boot, Quiet Boot, Plug & Play, Automatic DRAM and PCIe Configuration, BIOS Support for S.M.A.R.T., Advanced Power Management, ACPI S3/S4 (planned), Wake on time from S5. No legacy OS support, no MBR installation (UEFI only) Programmable 3-stage Watchdog to generate system reset event Integrated TPM V2.0 (Intel® integrated)
SYSTEM CONTROL	WATCHDOG REAL TIME CLOCK TPM FP HEADER SECURITY	1x Header for Reset button, HDD LED, Power button, Power LED Recovery BIOS, System and BIOS Password, Boot Sequence Control, Serial-/USB-Port Access Protection, Write Protection for Flash BIOS, EraseDisk (BIOS Feature), Intel integrated TPM V2.0
COOLING	FAN	2x PWM fan (CPU/System)
SOFTWARE	OS SUPPORT	MS Windows® 10 IoT (LTSC), MS Windows® 11, MS Windows® 11 IoT (LTSC), Linux 64 No legacy OS support, no MBR installation (UEFI only)
MECHANICAL	DIMENSION (L x W)	Mini-STX: 5.5" x 5.8" (140 x 148 mm)
ENVIRONMENTAL	OPERATION TEMPERATURE	0 °C - 60 °C
CERTIFICATION	EMC + SAFETY	Planned: cTUVus acc. IEC62368-1, CE Class B incl. Industrial Immunity, UKCA, FCC-B verified

Motherboard Versions

	PROCESSOR (SoC)	GRAPHICS Intel® UHD Gen12 Gfx	MEMORY
K4021-U2	Intel® Core™ Ultra 5 125U 12-Core @15W TDP (Flex cTDP option **) TDP 15W: 1.3 / 4.3 GHz	GPU @ 1.85 GHz 64x EU Up to 4 displays 4K120/5K60 HDR (1 pipe/1 port), 8K60 (2 pipe/1 port), 4x4K60 HDR (concurrent)	DDR5-5600 Two sockets Max. 96 Gbyte
K4021-U5	Intel® Core™ Ultra 7 155U 12-Core @15W TDP (Flex cTDP option **) TDP 15W: 1.7 / 4.8 GHz	GPU @ 1.95 GHz 64x EU Up to 4 displays 4K120/5K60 HDR (1 pipe/1 port), 8K60 (2 pipe/1 port), 4x4K60 HDR (concurrent)	DDR5-5600 Two sockets Max. 96 Gbyte

*) Base Frequency / 1 core Turbo / Multi core Turbo

**) cTDP - Easy & flexible reduction of CPU TDP down to 12 W

Power Supply Requirements

SOURCE	VOLTAGE RANGE	MIN. PS LOAD	MAX. VOLTAGE TOLERANCE	TYP. MOTHERBOARD INPUT POWER ¹	MAX. MOTHERBOARD INPUT POWER ²
DC-IN (WideRange)	9-24V	0 A	-5%/+10%, max 28V	12W / 24W	120 W (external or internal DC-In)
USB-C (Rear)	20V PD Sink	0 A	20V: +-5%	12W / 24W	100 W

1) Motherboard incl. Memory and M.2 NVMe SSD (approximations for MS Windows 10 Idle Mode / Full Processor Load @ 15 W TDP)

2) Motherboard incl. Memory, M.2, PCIe/M.2 PCIe devices, USB
See TechNotes document for detailed power requirements

FEATURES	Chipset / SoC (APU) DP / HDMI / LVDS / eDP Stereo Audio / 5.1 Multichannel Audio / Front Panel Audio Buzzer /int. Speaker support (stereo)² GbE LAN / Dual GbE LAN / 2.5 GbE LAN / 5 GbE Lan WoL / PXE / LAN Teaming / TSN SATA / SATA RAID / M.2 (SATA) / M.2 (PCIe/NVME) USB 2.0 / USB 3.2 (Gen1) / USB 3.2 (Gen2) / USB 3.2 (Gen2x2) Type-C FAN monitored & controlled CPU / AUX1 / AUX2 TEMP monitored CPU / onboard sensors / external sensor	Intel® Core™ Ultra SoC + / - / + / + + / 0¹ / + + / + + / - / - / + + / + / + / + + / + / - / + + / - / + / + + / + / - + / + / -
SPECIAL FEATURES	COM interface support for RS-232 / RS-485 / RS-422 Fan configuration / System Monitoring Recovery BIOS / Flash Update / Multi Boot HDD Password / EraseDisk / TPM V2.0 onboard / optional TPM module Multi Stage Watchdog Operating Mode 24-7 / 8-5 (hrs per day - days per week) Motherboard operating temperature range (chassis inside)³	+ / - / - + / + + / + / + + / + / + / - + + / - 0 °C ... +60 °C
INTERNAL CONNECTORS	SO DIMM Sockets (DDR5 5600) SATA-III / M.2 Key-M SSD / M.2 Key-B M.2 2230 (Key-E for WLAN/Bluetooth) Front Panel Audio (9-Pin, HD Audio) / S/PDIF Out (Digital Audio) USB 2.0 pin header (2 port) / USB 2.0 single port header / USB Stick socket USB 3.2 Gen1 pin header (2 ports) / USB 3.2 Gen2 Type A header Serial COM header / CCTalk header / Parallel Port header LVDS / LVDS Backlight / Embedded DisplayPort @ 4 lanes FAN PSU / CPU (PWM) / AUX1 (PWM) Intrusion (Case Open) / GPIO (8 Bit) / SMBus Stereo Speaker header / Digital Mic header Front Panel (Power Switch, Reset Switch, LEDs, Intel 10 pin header)⁴ SATA Drive Power Connector (5 V/12 V) / DC-In Connector 9-24V (4 pin)	2 2 / 2 / 1 1 1 / 1 2 / 0 / 0 0 / 0 2 / 0 / - 1 / 1 / 1 - / 1 / 1 1 / 1 / 1 1 / - 1 1 / 1
EXTERNAL CONNECTORS	HDMI / DVI / VGA DisplayPort / USB Type-C Alternate Mode (DPoC) / Thunderbolt™ +USB4® Audio Mic. In / Line in / Line out (or driver configuration) LAN (RJ-45) / PS/2 Keyboard / Mouse USB 2.0 / USB 3.2 Gen1 / USB 3.2 Gen2 DC-In connector (external input) 9-24V, 100W max. Serial COM interface	- / - / - 2 / 1 / 1 1 / 0 / 1 2 / - / - 0 / 0 / 4 1 0

1) Multichannel audio only via S/PDIF or DisplayPort™

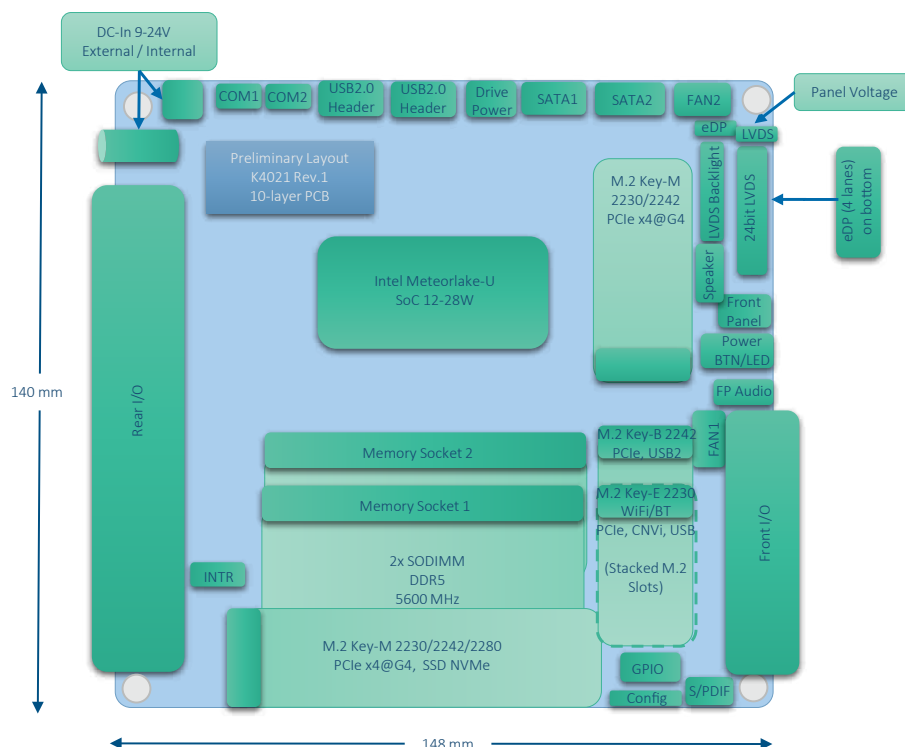
2) Stereo speaker support; 2 W @4Ω

3) Forced cooling required for high operating temperature range. See TechNotes document for details

4) Header pin pitch is 2.0mm

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Connector/Socket Diagram



ARTICLE	PART NO.	DESCRIPTION
K4021-U2	F5120-V252	Intel® Core™ Ultra 5 125U
K4021-U5	F5120-V255	Intel® Core™ Ultra 7 155U

Accessories

SLIM ACTIVE HEATSINK + BACKPLATE	F5000-C027	max. 28W TDP, designed for SMARTCASE™ S502
DRIVE POWER CABLE	S26361-F5000-K001	400 mm, power connector for 1x SATA and 1x slimline DVD
SERIAL PORT CABLE	S26361-F5000-K007	Short cable (120 mm), w/o slot bracket
SERIAL PORT CABLE	S26361-F5000-K010	400 mm, fullsize slot bracket
AC-ADAPTER 19V/65W	S26361-F5000-P006	For applications up to 35 W TDP (SoC)
AC-ADAPTER 20V/120W	S26361-F5000-P007	lockable connector
WLAN ANTENNA KIT	S26361-F5000-W005	WLAN antenna kit; left (grey)/right (black) antennas incl. cable for SMARTCASE™ S5xx. M.2 WLAN module not included!
WLAN ANTENNA KIT	F5000-W006	Box contains 10 dual antennas (incl. antenna cable) for SMARTCASE™ S5xx series. Additional support for WiFi 6E/WiFi 7; replaces F5000-W005
SMARTCASE™ S502	F5000-J015	Chassis kit solution, active cooling
WALL MOUNT BRACKETS	S26361-F5000-X001	Suitable for SMARTCASE™ S5xx, 2x Brackets per chassis incl. screws
VESA MOUNT KIT	S26361-F5000-X002	Suitable for SMARTCASE™ S5xx
DC-IN CONNECTOR LOCK	S26361-F5000-X003	Suitable for SMARTCASE™ S5xx, fits to AC-Adapter F5000-P006
CHASSIS INTRUSION KIT FOR SC-S5XX	F5000-K017	Contains 20x chassis intrusion cable plus 20x mounting bracket for Smartcase™ S5xx

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