



- **Functional Safety SIL2**
- **Intel Atom x6000**
- **Powerful Graphics**
- **Rugged and Fanless**
- **Dedicated Industrial Engine**
- **Real Time Computing**
- **Up to 3x 2.5GbE Ports**
- **Customizable**
- **Professional Services**

## Features

**Functional Safety** - Certifiable for Functional Safety applications according to IEC 61508-2:2010 SIL2 / ISO 13849-1 Cat 3 PL = d

**Intel Atom x6000 Series** - The Atom x6000 Series delivers up to 40% more performance compared to the previous generation, while keeping within a similar power budget

**Powerful Graphics** - The new integrated GPU with up to 32 Execution Units is up to 2x faster than the previous generation and supports up to 3 independent high resolution screens

**Rugged and Fanless** - Operates from -40 to +85°C, with error correcting code memory and soldered memory

**Dedicated Industrial Engine** - An integrated and independent ARM core provides unprecedented industrial capabilities and a range of native industrial interfaces (CAN-FD, UARTS, ADCs, QEPs, GPIO, Ethernet)

**Real Time Computing** - Support for TCC (Time Coordinated Computing) and TSN (Time Sensitive Networking) enables soft Real Time applications

**Up to 3x 2.5GbE Ports** - Support for 2.5GbE ranges from one port (COM Express) to 3x ports (COM Express with proprietary expansions)

**Customizable** - Comes with optional personalization and full customization services, ranging from factory options to deep HW/SW configuration changes

**Professional Services** - Provides the foundation for Eurotech Professional Services that span from carrier board development to complete system design, certification and manufacturing

## Description

The CPU-161-20 is a rugged module based on COM Express that features the Intel Atom x6000 Series and provides additional features via extensions on unused pins, delivering a range of novel interfaces that can greatly simplify the design of the carrier board and reduce its cost. The CPU-161-20 is also suitable for Functional Safety (FuSa) applications, and is certifiable according to IEC 61508-2:2010 SIL2 / ISO 13849-1 Cat 3 PL = d. An integrated, independent and specialized core oversees the semi-lockstep execution of critical workloads. On the 4 core versions of the CPU-161-20, critical and non-critical workloads can be executed simultaneously, via hypervisor separation of the FuSa and non-FuSa environments. Designed for fanless applications in harsh environments where long term reliability is a must, the CPU-161-20 delivers up to 4 CPU cores and 32 GPU execution units and in-band ECC RAM. It features an all-soldered down design to improve resilience and thermal coupling, and comes with a -40 to +85°C operating temperature. Both the CPU and the integrated GPU deliver great performance improvements compared to the previous Intel Atom generation, with a speed up that is up to 40% for traditional computing and up to 2x for graphics acceleration, while keeping the TDP at 12W or less.

The CPU-161-20 fully exploits a new capability of the Intel Atom x6000 Series: an embedded ARM core provides an independent engine that manages a large number of native industrial interfaces, including Ethernet ports, ADCs, Quadrature Encoders, GPIOs, UARTs and CAN-FD. The combination of the independent engine with Time Sensitive Networking (TSN) and Time Coordinated Computing (TCC) enables soft Real Time applications. TSN is an evolution of the Ethernet standard that provides time determinism to networked communications, while staying completely compatible with the existing Ethernet infrastructures. TCC bridges the synchronization of the internal clocks with the network to achieve microsecond accuracy.

Supported operating systems include Everyware Linux (based on Yocto); additionally, the CPU-161-20 supports Everyware Software

## FuSa Rugged Intel Atom x6000 Series - COM Express Compact Type 6

Framework (ESF), a commercial, enterprise-ready edition of Eclipse Kura, the open source Java/OSGi middleware for IoT gateways. Professional Services are available for the CPU-161-20, starting from BIOS personalization and including carrier board design, system development and production. Deep module customization, such as feature changes are also available.

| Ordering code: CPU-161-20-XX |                    |                                                                                                          |                                                                                                                                                     |
|------------------------------|--------------------|----------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| XX                           |                    | -21                                                                                                      | -22                                                                                                                                                 |
| PROCESSOR                    | CPU                | Atom x6200FE 1.00GHz, 2 Cores                                                                            |                                                                                                                                                     |
| GPU                          | Type               | Not Available                                                                                            |                                                                                                                                                     |
|                              | Execution Units    | Not Available                                                                                            |                                                                                                                                                     |
| MEMORY                       | RAM                | 4GB DDR4 IB ECC, 3200MT/s, Memory Down                                                                   |                                                                                                                                                     |
| STORAGE                      | Embedded           | 1x SPI-Flash - 1x EEPROM                                                                                 |                                                                                                                                                     |
|                              | SATA               | 2x SATA 3.0 (up to 6Gb/s)                                                                                |                                                                                                                                                     |
|                              | SD                 | 1x SDXC (Factory Option)                                                                                 |                                                                                                                                                     |
| MULTIMEDIA                   | Video Ports        | Not Available                                                                                            | 2x DDI (HDMI/DVI/DP++), 1x LVDS/eDP (eDP Factory Option), 1x VGA (Factory Option), Triple Display: VGA+DDI1+DDI2 or LVDS+DDI1+DDI2 or eDP+DDI1+DDI2 |
|                              | Video Resolution   | Not Available                                                                                            | DDI1 and DD2: 4Kp60 / VGA: 1920x1200@60Hz LVDS: 1920x1200@60Hz, Dual Channel, 24bit                                                                 |
|                              | Video Acceleration | Not Available                                                                                            | HW Encode: HEVC/H.265, H.264/AVC, VP9, M/JPEG; HW Decode: HEVC/H.265, H.264/AVC, VP8, VP9, VC1, M/JPEG, MPEG2                                       |
|                              |                    | Yes (SPI)                                                                                                |                                                                                                                                                     |
|                              | Audio              | HDA Interface / Speaker / I2S / DMIC                                                                     |                                                                                                                                                     |
| I/O INTERFACES               | Ethernet           | 1x 10/100/1000/2500Mbps with TSN 2x SGMII 10/100/1000/2500Mbps (Factory Option)                          |                                                                                                                                                     |
|                              | USB                | 2x USB 3.0 / 8x USB 2.0                                                                                  |                                                                                                                                                     |
|                              | Serial             | 3x UART 2-wire 5x UART 4-wire                                                                            |                                                                                                                                                     |
|                              | CANBus             | 2x CAN-FD                                                                                                |                                                                                                                                                     |
|                              | Digital I/O        | 5x GPI / 4x GPO / 3x GPIO or 1x GPI / 3x GPIO / SDXC (Factory Option)                                    |                                                                                                                                                     |
|                              | Other Industrial   | 6x ADC, 2x Quadrature Encoder                                                                            |                                                                                                                                                     |
|                              | PCI Express        | 1x PCIe x4 Gen3 (or 2x PCIe x2 Gen3, or 4x PCIe x1 Gen3) 2x PCIe x1 Gen3 (Mutually Exclusive with SGMII) |                                                                                                                                                     |
|                              | System Bus         | 1x LPC / 2x I2C / 3x SPI / 1x SMBus                                                                      |                                                                                                                                                     |
| OTHER                        | RTC                | Yes                                                                                                      |                                                                                                                                                     |
|                              | Watchdog           | Yes                                                                                                      |                                                                                                                                                     |
|                              | TPM                | TPM 2.0 (Discrete Chip)                                                                                  |                                                                                                                                                     |
|                              | Sensors            | Temperature                                                                                              |                                                                                                                                                     |
| POWER                        | Input              | 12V, 5VSBY, 3V_RTC (ATX Mode) / 12V, VCC_RTC (AT Mode)                                                   |                                                                                                                                                     |
|                              | Consumption        | 4.5W (CPU TDP)                                                                                           | 12W (CPU TDP)                                                                                                                                       |
| ENVIRONMENT                  | Operating Temp     | -40 to +85°C                                                                                             |                                                                                                                                                     |
|                              | Storage Temp       | -40 to +85°C                                                                                             |                                                                                                                                                     |
|                              | Humidity           | 5% to 90% RH                                                                                             |                                                                                                                                                     |
| CERTIFICATIONS               | Functional Safety  | Certifiable according to IEC 61508-2:2010 SIL2 / ISO 13849-1 Cat 3 PL = d                                |                                                                                                                                                     |
|                              | Regulatory         | CE, FCC, ISED                                                                                            |                                                                                                                                                     |
|                              | Safety             | EN 62368, UL 60950                                                                                       |                                                                                                                                                     |
|                              | Environmental      | RoHS3, REACH                                                                                             |                                                                                                                                                     |

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FuSa Rugged Intel Atom x6000 Series - COM Express Compact Type 6

|            |            |                                                                      |
|------------|------------|----------------------------------------------------------------------|
|            | Compliance | Based on PICMG COM Express R3.0, Type 6, with Proprietary Extensions |
| MECHANICAL | Dimensions | 95x95mm (LxW) - COM Express Compact                                  |

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| Supported Software |               |                                                            |
|--------------------|---------------|------------------------------------------------------------|
| SOFTWARE           | OS            | Everyware Linux (Professional Services: Other OS and RTOS) |
|                    | IoT Framework | Everyware Software Framework (Java/OSGi)                   |

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