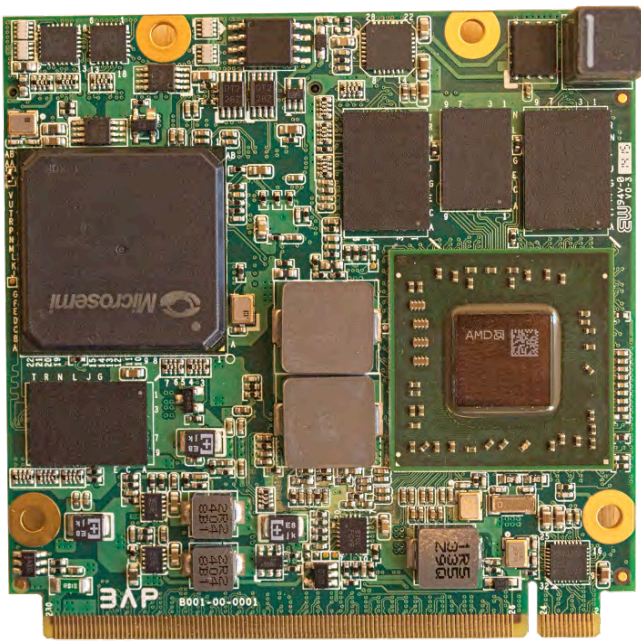


# Embedding High Reliability & Safety Critical Heterogeneous Data Processing



## DESCRIPTION

UNIBAP's e20xx/e21xx heterogeneous computing product families are radiation tolerant high-performance compute modules for onboard data processing. The products have spaceflight heritage and uses low power embedded x86 compatible AMD® G-series SOC products from the 1st, 2nd, and LX families. The SOC is paired with a powerful Microsemi® SmartFusion2™ FPGA which provides IO extension and board supervisory management through IP core state-machines or embedded ARM® Cortex™ M3 micro-controller.

The e20xx/e21xx products provides common interfaces for command and data handling, robots, intelligent automation, and autonomous systems, including: Gigabit Ethernet, USB v2.0/v3.0, PCIeexpress®, SerDes, LVDS, SATA v3.0, Serial ports, GPIO, CAN 2.0b, I2C, and SPI. The GPIO capabilities of the FPGA can be used for optional interfaces using different (not included) IP cores.

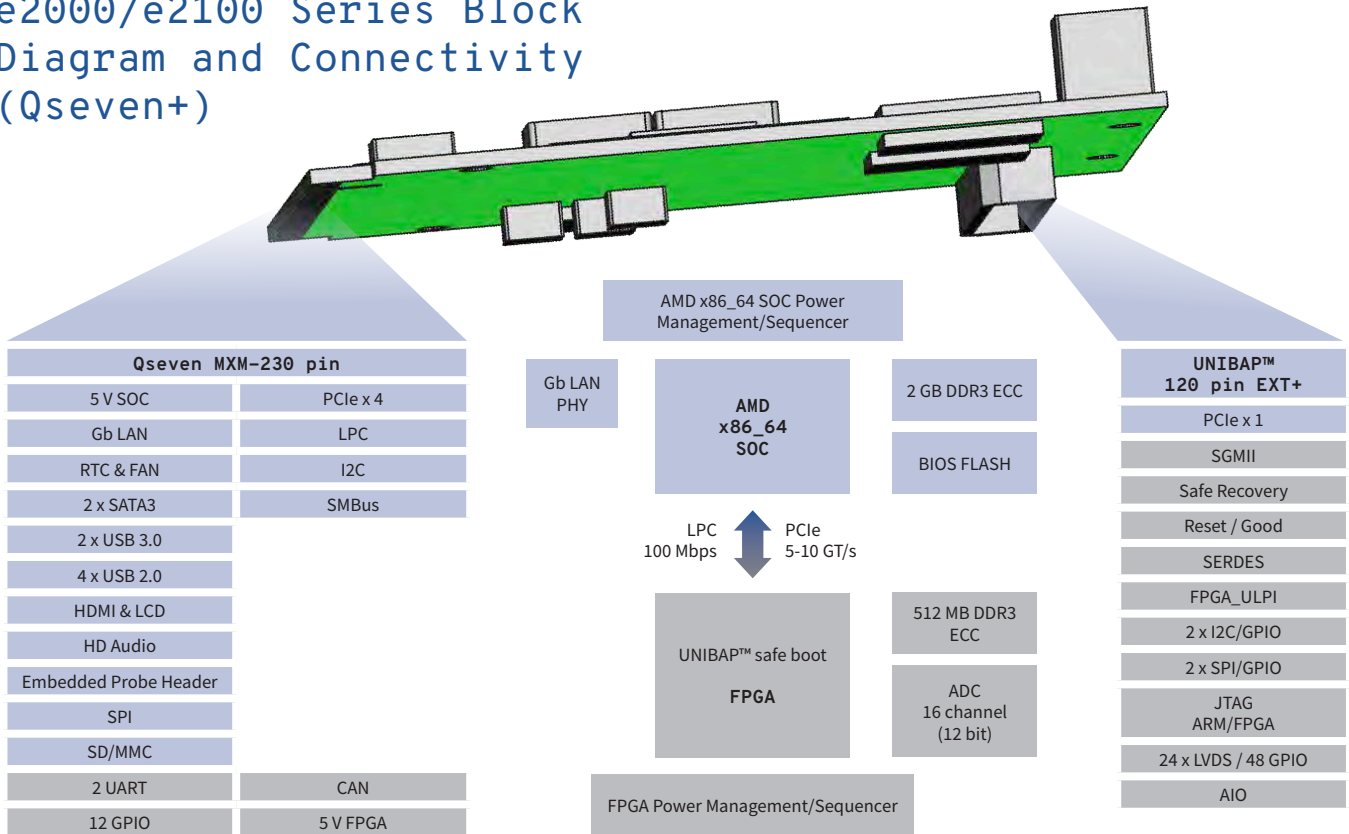
UNIBAP® e20xx/e21xx families of products are the perfect choice for autonomous systems with high demands for data fusion and sensor interfaces using optimized heterogeneous parallel algorithms and extensive IO.

*Reference: Bruhn, F.; Brunberg, K.; Hines, J.; Asplund, L.; Norgren, M., "Introducing radiation tolerant heterogeneous computers for small satellites," in Aerospace Conference, 2015 IEEE, vol., no., pp.1-10, 7-14*

## SPECIFICATION HIGHLIGHTS

<b>AMD SoC CPU</b>	AMD® Embedded G-series SOC Series 1st gen (e2000), 2nd gen (e2100), LX (e2190), 64 bit x86 Jaguar/Puma architecture.	<b>FPGA</b>	Microsemi® SmartFusion2™
<b>AMD SoC GPU</b>	HD RADEON GPU, 2 CU (Up to 77 GFLOPS) DirectX™ 11.1, OpenCL™ 1.2, OpenCL 1.2+, OpenGL 4.5+, Vulkan 1.0, H.264 encoding/decoding	<b>Safety MCU</b>	ARM® Cortex™-M3 MCU
<b>Graphics Output</b>	HDMI, LCD/LVDS (e2000), eDP (e21xx)	<b>AMD OS</b>	Linux (typ. LUbuntu) Opt. Windows 7, Solaris, VxWorks
<b>Memory</b>	SoC: 2 GB DDR3 1066 to 1333 with ECC FPGA: 512 MB DDR3 up to 667 with ECC	<b>FPGA OS</b>	Typ. Bare metal / FreeRTOS Optional. RTEMS, Ada Ravenscar
<b>Board size</b>	70 × 70 mm <sup>2</sup>	<b>USB / SATA</b>	2×USB 3.0, 4×USB 2.0, 2× SATA v3
<b>Connectors/IO</b>	Qseven® MXM 230, Unibap Ext Connector 120 IO	<b>Interconnect</b>	PCIe x4, 20 GT/s PCIe 2x1 Lanes, 5 GT/s PCIe x2 10 GT/s (AMD/FPGA)
<b>Temp. range</b>	0 °C to 70 °C (Commercial) -40 °C to 70 °C (Ext. temperature, special)	<b>Ethernet</b>	1 x 1000Base-T Gigabit (AMD) SGMII Interface (FPGA)
<b>Power reference</b>	Depending on SoC selection and operational modes: 4-20 W. Typ. 10 W.	<b>Other</b>	Serial/UART, CAN, I2C, SPI, GPIO, LVDS, SERDES.
		<b>Qualification</b>	IPC 6012C Class 2/3 PCB, IPC 610 Class 2/3 soldering, ECSS-Q-30 std derated components

## e2000/e2100 Series Block Diagram and Connectivity (Qseven+)



Block diagram of e20xx an e21xx family of heterogeneous computational modules.



e2000/e21000 family Optimized Development Environment (ODE kit)

**Advanced Health Monitoring & Remote Maintenance**  
Extensive tracking of

- voltages
- currents
- power consumption
- temperatures
- bit error detection & correction
- SoC power optimization