WMXM-A2000E-VO

NVIDIA Ampere, 4 Video Outputs, Chip-Down Design

Key Features

- NVIDIA RTXTM GA107, 2560 CUDA cores, 80 Tensor cores, 20 RT cores
- Chip-down WOLF design and fabrication meets military and aerospace specifications
- 4 independent video outputs, with support for DisplayPort, HDMI, DVI, VGA, LVDS
- 8 GB GDDR6 memory, 128 Bit, 192 GB/s max
- Configurable operating power, 26W to 80W

GPU Features

- Up to 4 DisplayPort 1.4 digital video outputs
- Up to 4 HDMI/DVI video outputs
- Option for one VGA output
- Option for LVDS LTX and LVDS UTX outputs
- Ampere GPGPU parallel processing support:
  - ☐ CUDA® Toolkit 11, CUDA Compute capability 8.6
  - ☐ OpenCL™ 3.0, DirectX® 12 Ultimate, OpenGL 4.6, OpenGL ES 3.2, Vulkan™ 1.2
- 80 Tensor Cores (3rd Gen), 34/66 TOPS (dense/sparse)
- 20 Ray Tracing cores (2nd Gen)
- NVENC (7th Gen) and NVDEC (5th Gen) with up to 8K video encoding and hardware decoding support

Connectivity / System Management

- GPU with PCIe Gen4 x8 interface
- Windows and Linux drivers
- NVIDIA Ampere driver support requires the following host CPU: Intel E, S/H/H35 Class, AMD H/HS Class

Mechanical / Open Systems Architecture

- High level of ruggedization:
  - ☐ Operating temperature: -40° to +85°C
  - ☐ Vibration (sine wave): 10G peak, 5 - 2000Hz
  - ☐ Shock: 40G peak
- Manufactured in NA, full component traceability
- Component derating meets or exceeds NASA and Rome Labs specifications for reliability
- Increased board rigidity due to thicker PCB material
- Hard gold used on connector card edge (30 µin)
- Additional mounting holes to reduce flexing under vibration and shock
- Standard MXM 3.1 connector compliance maintained
- Conformal coating options available

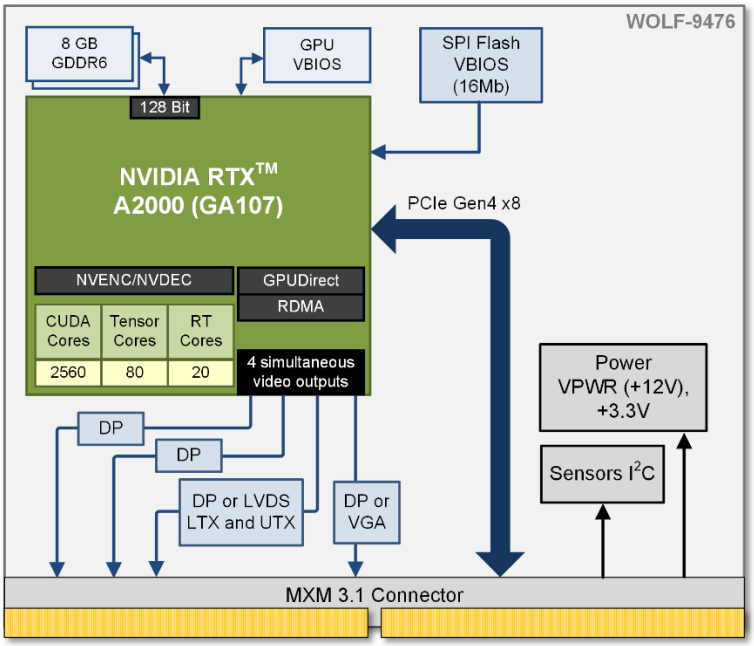
Overview

The WMXM-A2000E-VO module uses a WOLF chip-down design to provide NVIDIA's advanced Ampere architecture GPU technology in an extremely rugged module, making it an excellent choice for aerospace and defense applications. WOLF designs and manufactures these modules in North America with full component traceability.

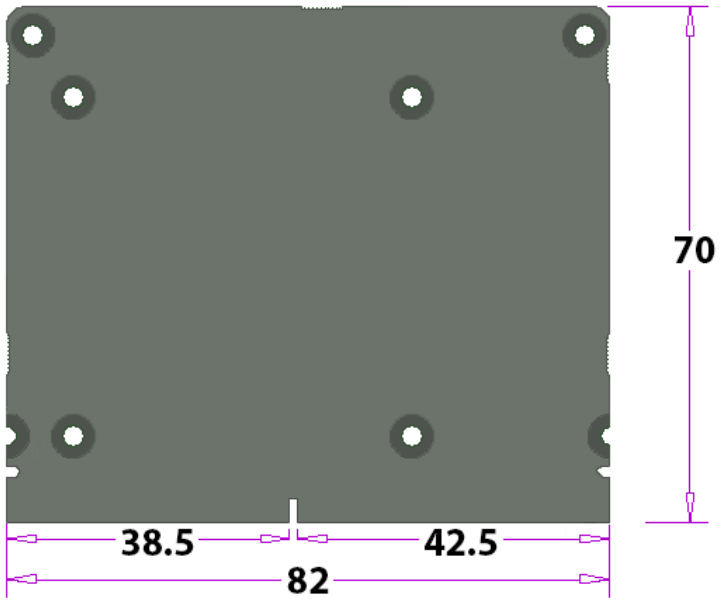
These modules are designed and manufactured specifically for use in the harsh environments encountered in military and aerospace applications. They have been designed to pass MIL-STD-810 and DO-160 environmental tests. They have been manufactured to IPC-A-610 CLASS 3 and IPC 6012 CLASS 3 for high reliability electronic products. They are compliant with IPC J-STD-001 soldering standards.

The A2000 GPU is an enormous leap in processing power compared to the previous generation Turing and Pascal GPUs. This rugged Ampere-based module can provide up to 8.25 TFLOPS of CUDA processing, providing up to 103 GFLOPS/Watt. It includes four independent video outputs, which support resolutions of up to 4K at 120Hz with 10-bit color depth. It supports PCIe speeds up to Gen4.

This information is subject to change



DP can be configured as:
DisplayPort/HDMI/DVI



The WOLF MXM board maintains the standard MXM outline and mounting holes locations. Additional half mounting holes are available near the MXM connector. The top side of the WOLF MXM exceeds the standard MXM maximum height of 1.5mm in region H2 by up to 3.5mm in some locations.

NVIDIA Ampere Streaming Multiprocessor (SM)

Each NVIDIA Ampere architecture streaming multiprocessor (SM) partition contains CUDA cores for FP and INT operations, Tensor cores for AI, Ray Tracing (RT) cores for rendering, Texture Units, a register file, and L1/Shared Memory. Each previous generation Turing SM partition had two primary datapaths, with one able to process FP32 operations while the other was limited to integer operations. An Ampere SM partition's two primary datapaths can both process FP32 operations, with one datapath dedicated to FP32 operations and the other capable of executing either FP32 or integer operations. For operations which require only FP32 operations this doubles the number of available CUDA cores per SM. This change to the available functionality of the primary datapaths along with many other improvements to the other components in the Streaming Multiprocessor allows Ampere GPUs to provide significant performance improvements.

TENSOR CORES FOR ARTIFICIAL INTELLIGENCE AND HPEC

Tensor Cores are designed to speed up the tensor / matrix computations used for deep learning neural network training and inferencing operations. NVIDIA Ampere architecture GPUs include the third-generation Tensor Core design which supports many new data types for improved performance, efficiency, and programming flexibility, including a new sparsity feature and a new Tensor Float 32 (TF32) precision mode.

NVIDIA provides CUDA-X AI and CUDA-X HPEC libraires which have been designed to work with NVIDIA Tensor Core GPUs to provide the tools needed to accelerate development of applications for AI and HPEC.

FAST GDDR6 MEMORY

Getting data into and out of a high performance GPU requires fast graphics memory to ensure that the memory does not become a system bottleneck. In moving from GDDR5 to GDDR6 the number of data transfers per clock cycle doubled from two to four, and memory chips can be read in dual-channel modes rather than just single channel modes. The newer GDDR6 memory does all of this while also slightly reducing the memory's average power consumption compared to using GDDR5 memory.

NVIDIA also uses memory compression technology, especially data color compression for reducing the amount of graphical information that needs to be transmitted. With Turing and the GDDR6 memory the latest generation compression technology provides a 20 to 30% memory compression efficiency increase.

HARDWARE ACCELERATED VIDEO ENCODE / DECODE

The Ampere GPU includes the NVENC video encode (version 7.2) and NVENC decode (version 5) hardware acceleration engine. Using the Ampere GPU for video encoding provides an efficient, high quality method to achieve real time 8K and 4K encoding without burdening the system CPU. The Ampere decoding engine includes support for several codecs, including AV1 hardware decoding support. The NVIDIA Video Codec SDK provides a complete set of APIs, samples and documentation for hardware accelerated video encode and decode.

PCIE GEN4 INTERFACE

Ampere is the first NVIDIA GPU generation to include support for PCIe Gen4, providing double the throughput of the previous generation.

This information is subject to change

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ORDERING CODES

The following table defines series of common order codes for the WMXM-A2000E-VO module. The asterisks denote characters of the part number that are defined based on common configuration options. Some configuration options for this module include:

- Default Power Threshold
- Display Interfaces
- Conformal Coatings
- Variant Locked

Ordering Number	Description
WOLF MXM with Ampere A2000	
947631-F000-***MXMvA0	WOLF MXM, NVIDIA A2000, PCIe Gen4 x8, IO: 4x DisplayPort,
947631-F002-***MXMvA0	WOLF MXM, NVIDIA A2000, PCIe Gen4 x8, IO: 3x DisplayPort, 1x VGA,
947631-F003-***MXMvA0	WOLF MXM, NVIDIA A2000, PCIe Gen4 x8, IO: 2x DisplayPort, 1x DVI, 1x VGA

* Contact Sales for the latest Ordering Numbers, available options, or MCOTS options

MANUFACTURING AND QUALITY ASSURANCE

WOLF designs modules to pass the following environmental standards:

- MIL-STD-810 (United States Military Standard for Environmental Engineering Considerations and Laboratory Tests)
- MIL-HDBK-217 (Reliability Prediction of Electronic Equipment)
- RTCA DO-160 (Environmental Conditions and Test Procedures for Airborne Equipment) on request

WOLF complies with the following management systems:

- AS9100D: Quality Management System - Requirements for Aviation, Space and Defense Organizations (certified)
- ISO 9001:2015: Quality management systems (certified)
- AS5553: Counterfeit Electronic Parts; Avoidance, Detection, Mitigation, and Disposition (compliant)
- NIST SP 800-171: Protecting Controlled Unclassified Information in Nonfederal Systems (compliant)

Boards are manufactured to meet the following standards:

- IPC-A-610 CLASS 3 (Acceptability of Electronic Assemblies)
- IPC 6012 CLASS 3 (Qualification and Performance Specification for Rigid Printed Boards, Class 3 for High Reliability Electronic Products)
- IPC J-STD-001 (Requirements for Soldered Electrical and Electronic Assemblies)

For more information, please contact:
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