XMC-BW500E-VO

NVIDIA RTX 500 Blackwell with 3 Video Outputs

Key Features

- NVIDIA RTX™ 500 (GB203) GPU with 1792 CUDA Cores, 56 Tensor Cores, 14 RT Cores
- 6 GB GDDR7 96-bit memory, up to 288 GB/s
- Up to 3 DisplayPort outputs, options for DVI/HDMI
- Configurable operating power, 30W to 60W

GPU Features

- Up to 3 simultaneous video outputs
  - ☐ DisplayPort++ 2.1b (up to HBR3)
  - ☐ 4K at 120Hz, with 12-bit color depth
  - ☐ DVI and HDMI support
- Blackwell GPGPU parallel processing support:
  - ☐ CUDA® Toolkit 12, Compute Capability 12.0
  - ☐ CUDA-X AI and CUDA-X HPEC libraires
  - ☐ OpenCL™ 3.0, DirectX® 12 Ultimate, OpenGL 4.6, OpenGL ES 3.2, Vulkan™ 1.4
- 56 Tensor Cores (5th Gen)
- 14 Ray Tracing cores (4th Gen)
- NVENC (9th Gen) and NVDEC (6th Gen) with up to 8K video encoding and hardware decoding support

Connectivity/System Management

- PCIe Gen4 x8 (Gen5 capable) to the XMC connector
- NVIDIA GPUDirect RDMA support
- Linux and Windows drivers available
- NVIDIA driver support requires the following host CPU: Intel E/S/H/H35 Class, AMD H/HS Class

Mechanical/Architecture

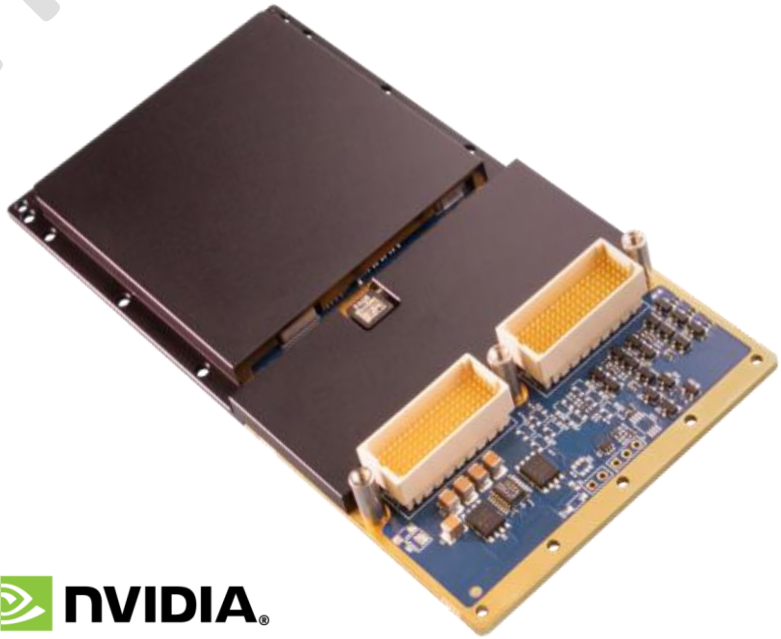
- Designed for Harsh Environments:
  - ☐ Rugged conduction cooled or air cooled
  - ☐ Operating temperature: conduction cooled -40° to +85°C, air cooled -40° to +71°C
  - ☐ Vibration (sine wave): 10G peak, 5 - 2000Hz
  - ☐ Shock: 40G peak for CC, 30G peak for AC
- Dimensions (mm): CC: 143.75x74; AC: 149x74
- Weight: CC: Approx. 276g; AC: Approx. 253g
- VITA 46.9 VPX I/O mapping patterns supported: X12d, X8d, X16s

Overview

This XMC module includes an advanced NVIDIA RTX™ 500 Blackwell embedded GPU. Data can be routed to the high-performance NVIDIA Blackwell architecture GPU for processing, encoding, or AI inference, and then be output via DisplayPort, HDMI, DVI or PCIe x8.

The NVIDIA Blackwell architecture includes CUDA cores for HPEC, 5th generation Tensor cores for AI and data science computations, and 4th generation Ray Tracing (RT) cores for visually accurate rendering. The denser Blackwell GPUs have more CUDA and Tensor cores operating at higher clock frequencies at the same power, delivering significantly more performance per watt compared to WOLF's previous generation product.

Unlocking the best performance requires the best cooling capability. WOLF's advanced cooling technology is designed to move heat using a low weight, high efficiency path to move heat away from the GPU.



NVIDIA RTX

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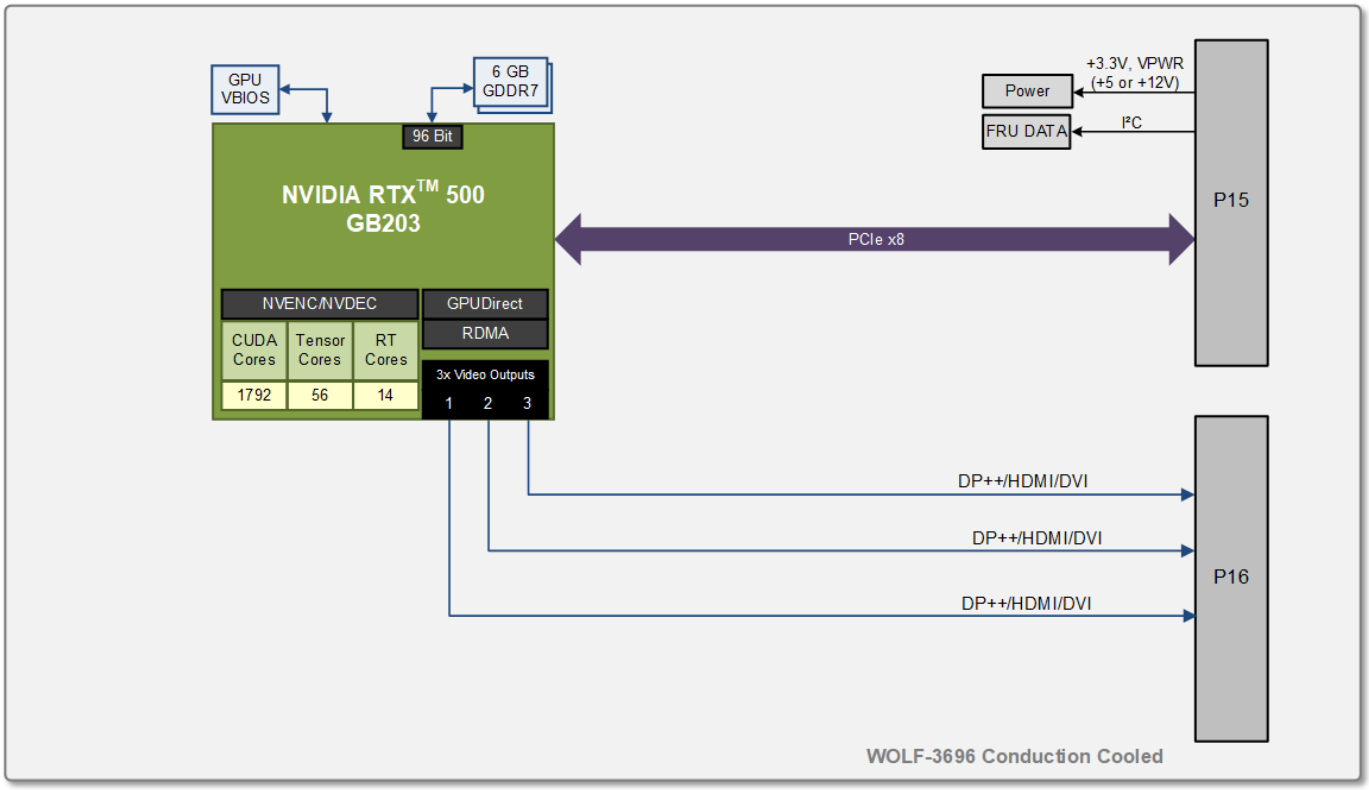

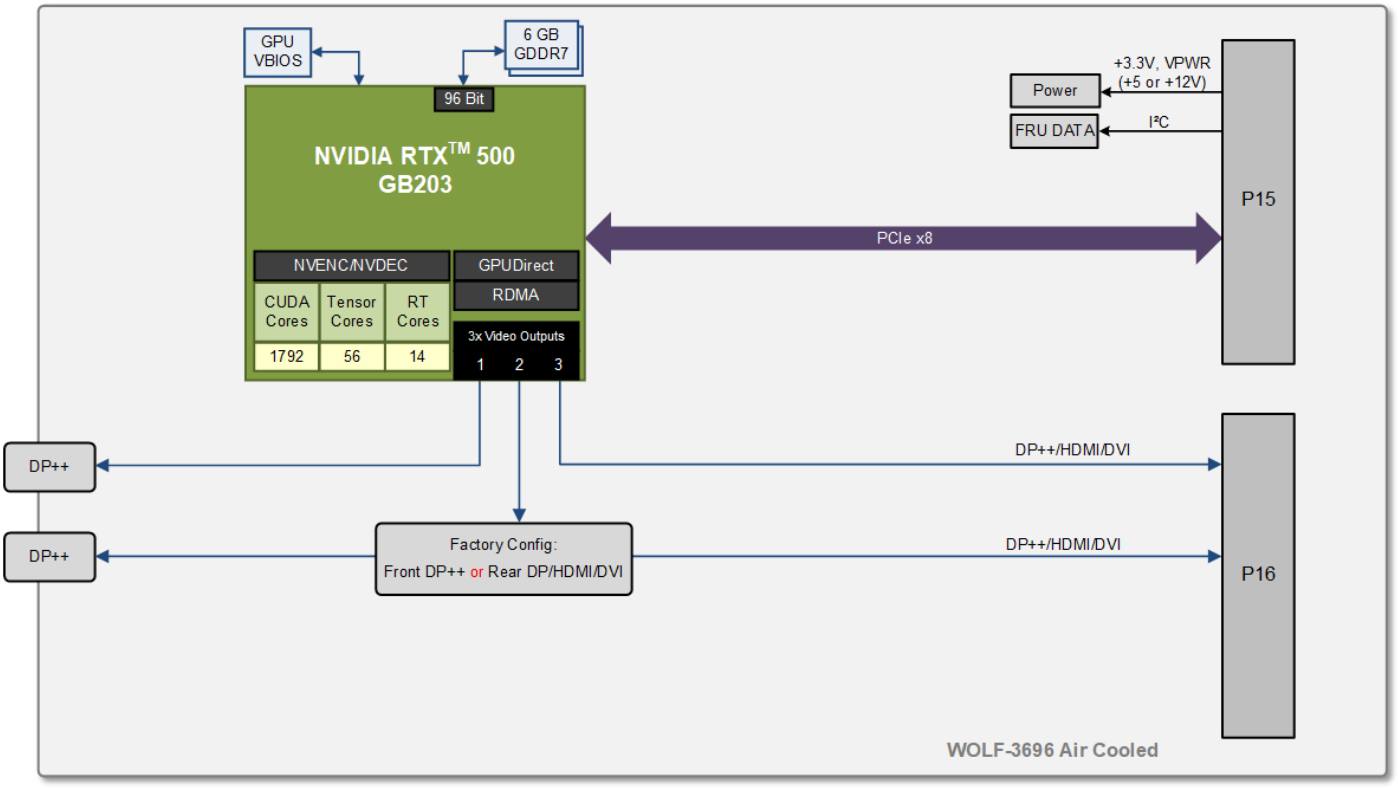

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Power and Performance

Powering the XMC board with a 5V source will provide up to a TBP (total board power) of 40W. Powering the XMC board with a 12V source will provide up to a TBP of 80W.

An NVIDIA GPU will operate at the GPU clock speed available at the set TGP (total GPU subsystem power). The highest clock speeds are available at the highest TGP power allowed by the GPU. When the TGP setting is decreased the clock speed will also decrease resulting in a decrease in processing speed. The GPU base clock speed will also decrease if the GPU temperature exceeds 89°C to protect the GPU from heat damage. If the GPU temperature is below 87°C the GPU can operate at full boost clock speeds when higher processing is required.

The Blackwell GB203 GPU typically operates at TGP power levels from 30W to 60W. At 60W the base clock of 2160 MHz provides 7.7 TFLOPS FP32 performance while the boost clock of 2565 MHz provides 9.2 TFLOPS. At 35W the base clock of 1357 MHz provides 4.9 TFLOPS while the boost clock of 1792 MHz provides 6.4 TFLOPS.

NVIDIA Blackwell GPU

NVIDIA Blackwell GPUs use an NVIDIA-custom TSMC 4N/4NP process (datacenter parts on 4NP), increasing transistor density and efficiency versus the prior generation. Building on Ada, Blackwell updates the SM (Streaming Multiprocessor) and adds 5th-generation Tensor Cores with new FP4/FP6 formats plus 4th-generation RT Cores, delivering much higher AI and ray-tracing throughput at comparable power. The memory subsystem moves to GDDR7 with PAM3 signaling and larger on-chip caches, boosting effective bandwidth, latency handling, and memory energy efficiency. Together, these advances raise performance-per-watt and overall throughput across graphics, AI, and simulation workloads.

Tensor Cores for Artificial Intelligence and HPEC

Tensor Cores accelerate the tensor/matrix math used in deep-learning training, inference, and high-performance embedded computing. NVIDIA Blackwell architecture GPUs introduce fifth-generation Tensor Cores that add new FP4 support alongside FP8, FP16, and TF32, with structured sparsity to increase throughput and efficiency while preserving accuracy.
NVIDIA provides CUDA-X AI and CUDA-X HPEC libraries optimized for Tensor Core GPUs, delivering the tools needed to speed development and deployment of AI and HPEC applications.

Fast GDDR7 Memory

Feeding a high-performance GPU demands memory that won't bottleneck the system. With Blackwell, the move from GDDR6 to GDDR7 brings a new PAM3 signaling scheme and lower-voltage operation, enabling much higher per-pin data rates and better energy efficiency. GDDR7 also expands internal parallelism (more independent channels per device), improving effective bandwidth utilization and latency handling under mixed workloads. In practical terms, next-gen boards can reach up to 896 GB/s (configuration-dependent) aggregate bandwidth at similar footprints, helping keep the GPU fully utilized for AI, graphics, and HPEC tasks—all while trimming memory power per bit transferred compared to GDDR6

Hardware Accelerated Video Encode / Decode

NVIDIA Blackwell GPUs integrate next-generation NVENC (encode) and NVDEC (decode) engines. Offloading video to the GPU enables efficient, high-quality real-time 4K and 8K workflows while freeing CPU resources. Blackwell boosts encode throughput and quality with improved rate control and lookahead and supports popular codecs—including H.264 (AVC), H.265 (HEVC), and AV1—for both encoding and decoding. The NVIDIA Video Codec SDK provides complete APIs, samples, and documentation for GPU-accelerated video.

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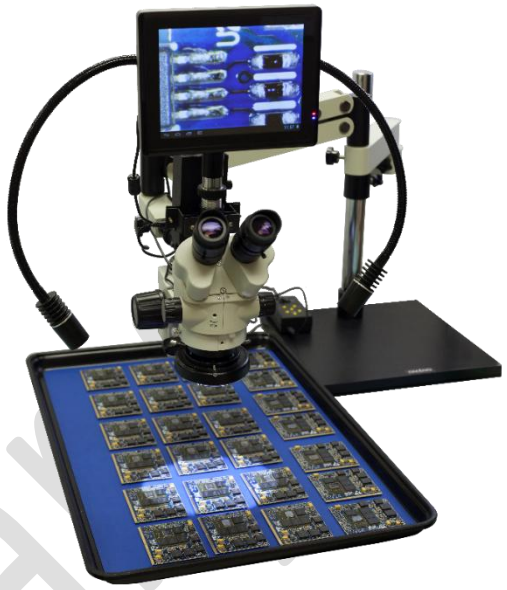
MANUFACTURING AND QUALITY ASSURANCE



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)

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