VPX3U-BW5000E-VO-HPC

NVIDIA Blackwell RTX5000 with HPC and video outputs

Key Features

- NVIDIA RTX™ 5000 (GB203) GPU with 10496 CUDA Cores, 320 Tensor Cores
- 24 GB GDDR7 256-bit VRAM with ECC support
- DisplayPort outputs, HDMI option for rear outputs
- Module power: 90W to 150W, configurable

GPU Features

- Blackwell GPGPU parallel processing:
  - ☐ CUDA Toolkit 12, Compute capability 10.0
  - ☐ CUDA-X AI and CUDA-X HPEC libraires
  - ☐ OpenCL™ 3.0, DirectX® 12 Ultimate, OpenGL 4.6, OpenGL ES 3.2, Vulkan™ 1.2
- 5th Gen Tensor Cores with additional new data precisions (new: FP4 and FP6, FP8 Gen2)
- GDDR7 memory provides over 50% more bandwidth compared to the previous generation
- NVENC (9th Gen) and NVDEC (6th Gen) with up to 8K video encoding and hardware decoding support

Connectivity / System Management

- PCIe x8 and x16 profiles
- IPMI system management
- NVIDIA GPUDirect RDMA support
- Linux and Windows drivers
- GB203 GPU support requires one of the following host CPUs: Intel H/HX/P/PX/S or AMD H/HS Class

Mechanical / Open Systems Architecture

- High level of ruggedization:
  - ☐ Rugged conduction cooled
  - ☐ Operating temp: CC: -40°C to +70°C standard, operational to +85°C
  - ☐ Vibration Random: VITA 47.1 Class V3 (5 to 2000Hz)
  - ☐ Vibration Sine: 10g peak (5 to 2000 Hz)
  - ☐ Shock: 40G (MIL-STD-810H, Method 516.8)
- Dimensions: 160mm x 100mm x 25.4mm
- Weight (approximately): 1.3 kg
- ANSI/VITA 48, 65 (VPX-REDI, OpenVPX)
- SOSA™ Aligned profile support: 14.6.11-0, 14.6.13-0, or OpenVPX 14.2.7

Overview

The VPX3U-BW5000E-VO-HPC module is powered by an NVIDIA RTX™ RTX 5000 Blackwell embedded GPU in a rugged WOLF 3U VPX module. The NVIDIA RTX 5000 GPU provides the advanced processing capabilities for high performance embedded computing (HPC) and artificial intelligence (AI) processing. This module includes a removeable front panel that exposes DisplayPort outputs on the front. It can also be configured to support an OpenVPX profile that provides two DisplayPort outputs on the rear.

The NVIDIA Blackwell architecture includes CUDA cores and 5th generation Tensor cores for HPC, AI and data science computations. The Blackwell GPU has an improved architecture which provides increased efficiency. The module supports 24GB of GDDR7 memory which provides over 50% higher bandwidth compared to the previous generation. The GPU supports PCIe x8 or x16, providing a fast data transfer path to/from the module.

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 from the hot GPU die to the wedgelocks.

This information is subject to change

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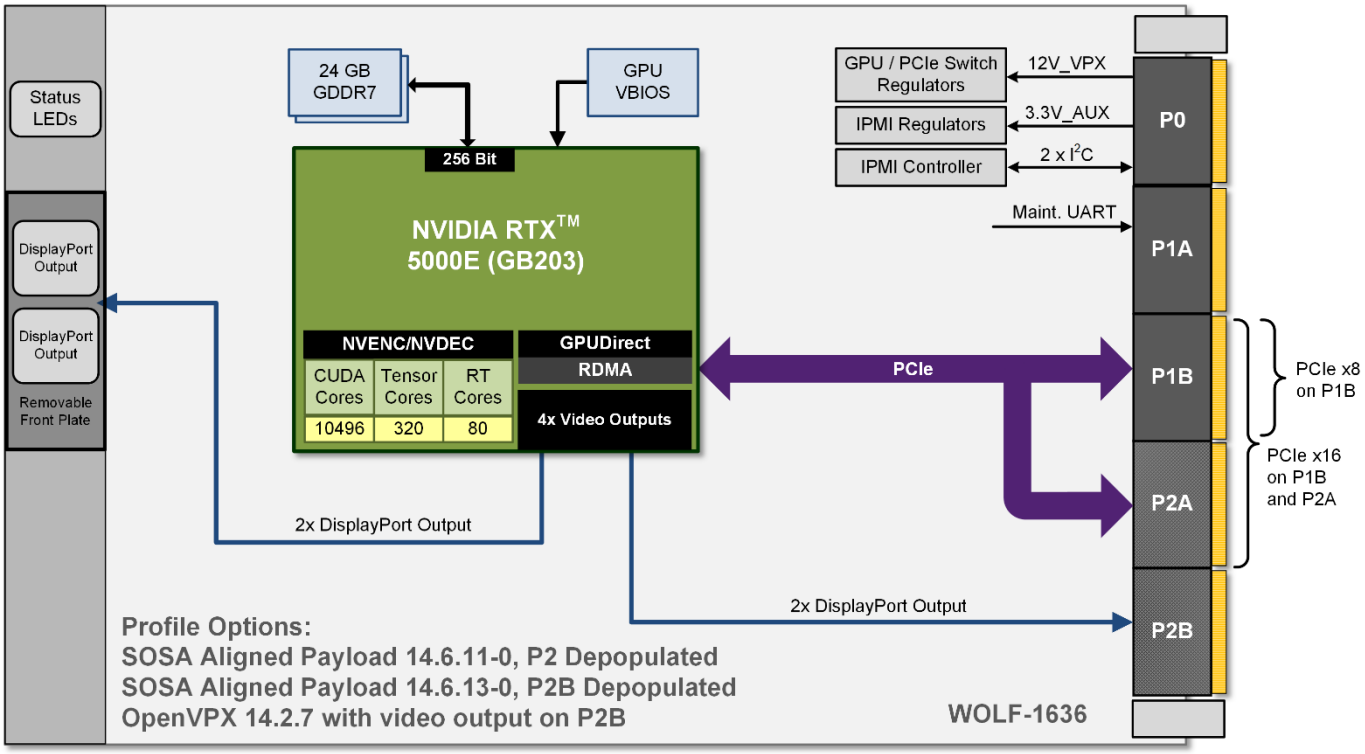
The VPX3U-BW5000E-VO-HPC module uses a WOLF chip-down design to provide NVIDIA's advanced Blackwell architecture GPU technology on an extremely rugged board, making it an excellent choice for aerospace and defense applications. WOLF designs and manufactures these modules in North America with full component traceability.



The OpenVPX profile supports DisplayPort video output, with two outputs supported on the rear connector, and two supported on the front panel under a small removeable panel. Note that the P2B pin assignment used for the DisplayPort video output for this product is not pin compatible with the previous generation WOLF-1538/1448/1348.

SOSA aligned slot profile options for this module include 14.6.13-0 with support for PCIe x16, and 14.6.11-0 with support for PCIe x8. The DisplayPort output under the removable front plate will be available for all slot profiles, including the SOSA aligned slot profiles.

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Power and Performance

An NVIDIA GPU clock speed is dependent on the TGP (total GPU subsystem power) and the GPU temperature. 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. If the GPU temperature exceeds 87°C the GPU clock speed will also decrease to protect the GPU from heat damage. If the GPU temperature is below 86.5°C the GPU can operate at maximum boost clock speeds at the currently available power when the GPU detects that higher processing is required.

The Blackwell GB203 GPU in this 3U VPX module will default to a TGP power of 100W. At 100W the GPU base clock of 1125 MHz provides up to 24.2 TFLOPS, and at higher GPU processing demands the boost clock can run up to 1792 MHz, providing up to 38.5 TFLOPS. A higher TGP of up to 150W can be configured if the GPU can be cooled sufficiently, with a maximum boost clock of 2370 MHz providing up to 50 TFLOPS.

NVIDIA Blackwell GPU

NVIDIA Blackwell GPUs have an improved architecture which provides increased efficiency. Blackwell GPUs have CUDA cores that can all handle either FL or INT operations, whereas previous generations restricted half of the CUDA cores for FL operations only. This is important for tasks that require lots of small, frequent lookups resulting in frequent address computations, which are commonly required by the matrix operations used by AI and HPC calculations. Optimizing these lookups ensures the data can reach the processing cores efficiently, permitting full use of the GPU processing power. The new Blackwell architecture also supports GDDR7 memory, which provides 55% more memory bandwidth. With the increased performance and memory handling abilities, and improved next Gen Tensor cores, the Blackwell GPUs are able provide significant performance increases compared to the previous generation.

Tensor Cores for Artificial Intelligence and HPC

Tensor Cores are designed to speed up the tensor / matrix computations used for deep learning neural network training and inferencing operations. NVIDIA Blackwell architecture GPUs include the fifth-generation Tensor Core design which supports many data types for improved performance, efficiency, and programming flexibility, including support for new INT4 and INT6 precision modes and microscaling formats. NVIDIA provides CUDA-X AI and CUDA-X HPEC libraires designed to work with NVIDIA GPUs to provide the tools needed to accelerate development of applications for AI and HPEC.

Hardware Accelerated Video Encode / Decode

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

SOSA and OpenVPX Slot Profile Support

This module can be configured to support SOSA aligned and OpenVPX slot profiles, including:

- SOSA Aligned 14.6.11-0 Payload Slot Profile, P2 depopulated
- SOSA Aligned 14.6.13-0 Payload Slot Profile, P2B depopulated
- OpenVPX 14.2.7 Slot Profile

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Ordering Codes

The following table defines series of common order codes for the VPX3U-BW5000E-VO-HPC module. The asterisks denote characters of the part number that are defined based on common configuration options. Some configuration options for this module include:

- SOSA or OpenVPX profiles
- Display Interfaces
- Variant Locked
- Default Power Threshold
- Conformal Coatings

Ordering Number	Description
3U VPX Blackwell AD5000 Single Slot Configurations	
163633-F***-***VPX3vA0	3U VPX, Conduction Cooled, 1", OpenVPX, NVIDIA Blackwell RTX 50000, 24GB GDDR7, PCIe x16 up to Gen4, Rear: 2x DP out, Front: 2x DP out
163633-F***-***VPX3vA0	3U VPX, Conduction Cooled, 1", SOSA 14.6.11-0 with P2 depopulated, NVIDIA Blackwell RTX 50000, 24GB GDDR7, PCIe x8 up to Gen4, Front: 2x DP out

* Contact Sales for the latest Ordering Numbers and available 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)

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