# VPX3U-RTX5000-SDI-4IO

## NVIDIA Turing 9.5 TFLOPS, 4 SDI In/Out, Analog In/Out, DP

**WOLF** ADVANCED TECHNOLOGY

## KEY FEATURES

- NVIDIA Quadro Turing RXT5000, 9.5 TFLOPS peak performance*, 3072 CUDA Cores, 384 Tensor Cores
- 16 GB GDDR6 256-bit memory with up to 448 GB/s
- SDI I/O, Analog I/O and DisplayPort++ Output
- Module power configurable from 70 to 140W
  *Peak performance requires the highest power configuration mode

## ADDITIONAL FEATURES

- Up to four 3G/HD-SDI inputs and outputs
- Analog inputs and outputs, CVBS by default, other options available
- Two DisplayPort 1.4 digital video outputs:
  - ☐ Support for High Dynamic Range (HDR) video
  - ☐ 4K at 120Hz or 8K at 60Hz with 10-bit color depth
  - ☐ HDMI and DVI options
- Turing GPGPU parallel processing:
  - ☐ 3072 CUDA® cores
  - ☐ CUDA Toolkit 10, CUDA Compute capability 7.5
  - ☐ OpenCL™ 1.2, DirectX® 12, OpenGL 4.6, OpenGL ES 3.2, Vulkan™ 1.0
- 384 Tensor Cores for AI inference processing
- 16 GB GDDR6 memory, 256-bit, 448 GB/s
- HEVC (H.265) and AVC (H.264) Turing NVENC and NVDEC hardware acceleration with up to 8K encode resolution and B-frame support
- PCI Express x8 Gen3
- Windows and Linux drivers

## SPECIFICATIONS

- High level of ruggedization:
  - ☐ Rugged Conduction-cooled or Air-cooled
  - ☐ Operating temperature: -20° to +71°C
  - ☐ Vibration (sine wave): 10G peak, 5 - 2000Hz
  - ☐ Shock: 30G peak for air-cooled, 40G peak for conduction-cooled
- Dimensions: 160mm x 100mm x 25.4mm
- Weight: To be Announced
- +12V or +5V Only Power Source Options
- ANSI/VITA 48, 65 (VPX-REDI, OpenVPX)

## OVERVIEW

The VPX3U-RTX5000-SDI-4IO module includes an NVIDIA® Quadro® Turing™ RTX5000 GPU and WOLF's Frame Grabber eXtreme (FGX). The RTX5000 includes CUDA cores for parallel processing and Tensor cores for dedicated AI inference. Support for GDDR6 memory provides twice the bandwidth of the previous generation's GDDR5 memory.

The WOLF Frame Grabber eXtreme (FGX) provides the module with conversion of video data from one standard to another, with a wide array of video input and output options for both cutting-edge digital I/O and legacy analog I/O. This module has been configured to accept up to four simultaneous 3G/HD-SDI inputs and analog inputs (CVBS by default, other options such as STANAG 3350, available). The video data can be routed to the powerful NVIDIA GPU for processing or encoding, and then output in several formats, including up to four 3G/HD-SDI, analog, and optional output to DisplayPort, HDMI or DVI.

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 pipeline from the GPU die to the wedgelocks.



**NVIDIA® QUADRO®** CERTIFIED

▪ EMBEDDED

**This datasheet is preliminary and is subject to change**

## NVIDIA TURING STREAMING MULTIPROCESSOR (SM)

The NVIDIA Turing architecture provides a 50% improvement in delivered performance per CUDA core compared to the Pascal generation. This is due to the new Turing Streaming Multiprocessor's independent integer datapath, allowing execution of concurrent integer and floating-point instructions, and the redesigned memory path which provides two times the bandwidth and more than two times the capacity for common workloads.

## 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.
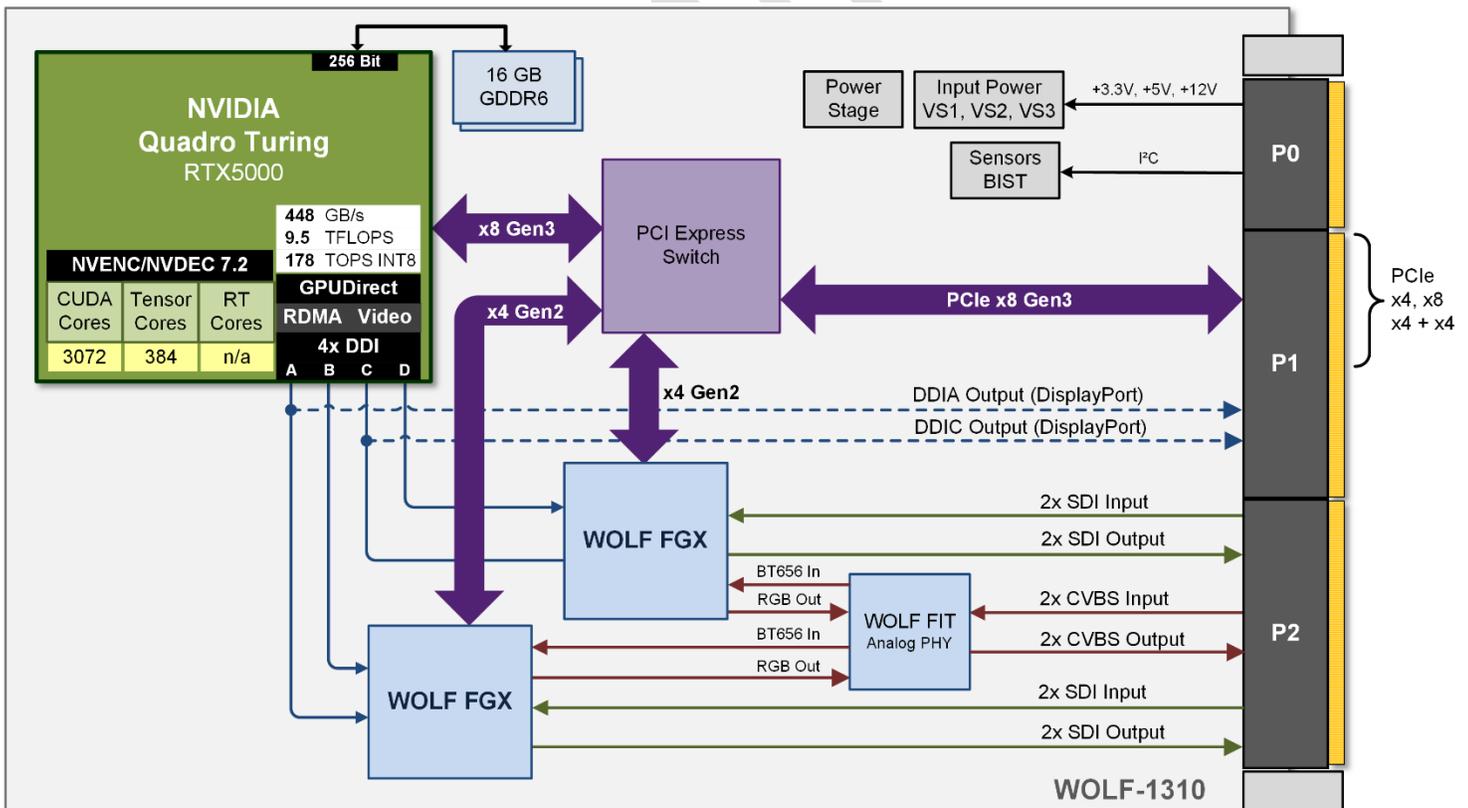


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## NVIDIA TENSOR CORES FOR ARTIFICIAL INTELLIGENCE AND HPC

Tensor Cores are designed to speed up the tensor / matrix computations used for deep learning neural network training and inferencing operations. Turing GPUs include a new version of the Tensor Core design that has been enhanced for inferencing. Turing Tensor Cores add new INT8 and INT4 precision modes for inferencing workloads that can tolerate quantization and don't require FP16 precision.

NVIDIA provides CUDA-X AI and CUDA-X HPC libraires which are specialized libraires built on top of CUDA. They have been designed to work with NVIDIA Tensor Core GPUs to provide the tools needed to accelerate development of applications for AI and HPC.

## HARDWARE ACCELERATED VIDEO ENCODE / DECODE

The RTX5000 chip includes the latest generation video encode/decode hardware acceleration engine (version 7.2). This adds support for HEVC (H.265) 8K encoding at 30 fps and B-Frame support. It also provides up to 25% bitrate savings for HEVC and up to 15% bitrate savings for AVC (H.264). Using the Turing encoding engine for video encoding provides an efficient, high quality method to achieve real time 8K and 4K encoding without burdening the system CPU.

As with previous versions of the encoding engine, NVENC supports CBR and VBR rate control, programmable intra-refresh for error resiliency, and a motion estimation (ME) only mode. The NVIDIA Video Codec SDK provides a complete set of APIs, samples and documentation for hardware accelerated video encode and decode on Windows and Linux.

## DESIGNED FOR SYSTEM INTEGRATION

The VPX architecture is diverse, spanning custom backplanes, an ambiguous system specification and differing input and output methodologies. That is precisely why WOLF modules come with factory configuration options to solve virtually all system integration challenges.

This WOLF module has been designed to include a WOLF FGX to support additional video output protocols that are not native to the Turing GPU. Through MCOTS services, the number of outputs and the protocols used can be changed to meet the requirements of many different system architectures.

This module has been designed to support VPX REDI (VITA 48) and OpenVPX (VITA 65). For PCIe X8 upstream and X4 upstream / X4 downstream this module is compatible with the following OpenVPX slot profiles:

- SLT3-PAY-1D-14.2.6
- SLT3-PAY-2F-14.2.7
- SLT3-PAY- 1F4U-14.2.8
- SLT3-PAY-8U-14.2.9

This module or others from the same family can be modified to support other OpenVPX profiles. Please contact WOLF to discuss your system level requirements.

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## ORDERING CODES

The following table defines series of common order codes for the VPX3U-RTX5000-SDI-4IO module. The asterisks denote characters of the part number that are defined based on common configuration options. Some common configuration options for this module are:

- Display Interfaces
- Conformal Coating Type

- +12V / +5V Main Power
- Default Power Threshold

- COTS, MCOTS or Locked
- PCIe Switch configuration

| Ordering Number | Description |
|---|---|
| **3U VPX NVIDIA Turing RTX5000 and FGX or RTX3000 and FGX Single Slot Configurations** | |
| 131023-F5**-*VPX3vA0 | 3U VPX, Air Cooled, 1", NVIDIA RTX5000, 4x SDI I/O, 2x analog I/O, DP out |
| 131033-F5**-*VPX3vA0 | 3U VPX, Conduction Cooled, 1", NVIDIA RTX5000, 4x SDI I/O, 2x analog I/O, DP out |
| 131023-F3**-*VPX3vA0 | 3U VPX, Air Cooled, 1", NVIDIA RTX3000, 4x SDI I/O, 2x analog I/O, DP out |
| 131033-F3**-*VPX3vA0 | 3U VPX, Conduction Cooled, 1", NVIDIA RTX3000, 4x SDI I/O, 2x analog I/O, 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 CLASS 3 (Requirements for Soldered Electrical and Electronic Assemblies)

Caveat: integrated third party modules may not meet the same standards as WOLF manufactured modules.