NVIDIA Quadro Technical Specifications

NVIDIA Quadro Workstation GPU
- Full 128-bit floating point precision pipeline
- 12-bit subpixel precision
- Hardware-accelerated antialiased points and lines
- Hardware OpenGL overlay planes
- Hardware-accelerated two-sided lighting
- Hardware-accelerated clipping planes
- Third-generation occlusion culling
- 16 textures per pixel
- OpenGL quad-buffered stereo (3-pin sync connection)
- Hardware-accelerated pixel read-back

Next-generation Shading Architecture
- Fully programmable GPU (OpenGL 2.0/DirectX 9.0c support)
- Unlimited long fragment and vertex programs
- Looping and subroutines (up to 256 loops per vertex program)
- Dynamic flow control
- Conditional execution

Architecture
- x16 PCI Express
- 128-bit IEEE floating point precision graphics pipeline
- 32-bit floating point per component
- 12-bit subpixel precision
- Up to 1GB memory
- Up to 42.0GB/sec. memory bandwidth
- Up to 2.4GB/sec. read back performance
- Unlimited programmability
- 3D volumetric texture support
- Single-system powerwall

High-level Shader Languages
- Optimized compilers for Cg, OpenGLSL, and Microsoft HLSL
- OpenGL 2.0 and DirectX 9.0c support
- Open source compiler

High-resolution Anti-aliasing
- Up to 32x full-scene anti-aliasing (FSAA), at resolutions up to 1920 x 1200
- 12-bit subpixel sampling precision enhances AA quality
- Rotated-grid FSAA significantly increases color accuracy and visual quality for edges, while maintaining performance

Memory
- High-speed memory (up to 1GB)
- Advanced lossless compression algorithms (color and Z data)

Unified Driver Architecture
- Single driver supports all products

Operating Systems
- Microsoft Windows® XP, 2000, NT®
- Linux—Full OpenGL implementation, complete with NVIDIA and ARB extensions (complete XFree 86 drivers)
- AMD®64, Intel EM64T

NVIDIA® niView™ Architecture
- Advanced multi-display desktop and application management seamlessly integrated into Microsoft Windows
- Dual DVI output—drives two independent digital displays at 1600 x 1200, or one at up to 3840 x 2400
- Dual-link TMDS—drives two digital displays at 3840 x 2400 @ 24Hz simultaneously
- 400MHz DACs—two analog displays up to 2048 x 1536 @ 75Hz each
- OpenGL stereo support for resolutions up to 3840 x 2400

Professional Certifications
- CAD
- Ansys
- Autodesk Architectural Desktop, AutoCAD, AutoStudio, DesignStudio, Inventor, Lightscape, Mechanical Desktop, Showcase, VIZ
- AVEVA POMS
- Bentley Microstation
- Co|Create OneSpace
- Dassault CATIA, SolidWorks
- ESRI ArcGIS
- IGEI Surf
- MSC.Nastran, MSC.Patran
- PTC Pro/E ENGINEER Wildfire, 3D-Part, Creo
- USB NX Series, I-deas, SolidEdge, Unigraphics, SDRC
- and many more...

Digital Content Creation (DCC)
- Autodesk Media and Entertainment 3ds Max, Maya, MotionBuilder, VIZ, Smoke, Lustre
- NewTek Lightwave 3D
- Side Effects Houdini
- Softimage|XSI
- and many more...

Video/Broadcast Applications
- Adobe Premiere, After Effects, Macromedia Suite
- Apple Shake
- Avid Media Composer Adrenaline HD, NewsCutter, Xpress Family, DS Nitris, Liquid Family, Studio
- Pinnacle Studio, and Liquid Edition
- Autodesk Media and Entertainment
- Fire, Smoke, Inferno, Flame, Flint, ToolKit, Combustion
- NewTek, TriCaster

Energy
- Schlumberger
- Paradigm GEO
- Landmark

1 Available on NVIDIA Quadro FX 5500, 4500 X2, 4500, 3500, and 3400
2 Bidirectional reflectance distribution function
3 Dual dual-link digital displays available on NVIDIA Quadro FX 5500, 4500 X2, 4500, 3500, 3000, and 1500
4 Available on NVIDIA Quadro FX 5000
5 NVIDIA Quadro FX 5450 and 5400 include one DVI and one analog output. NVIDIA Quadro FX 5000, 5000MX, and 5000M support a combination of VGA, DVI, DVI2, and TV-out
6 Dual single-link digital display available on NVIDIA Quadro FX 5000, 5000 MX, 4500 X2, 4500, 3500, and 3500
7 Available on NVIDIA Quadro FX 5450, 5000 S2, 4500 S2, FX 3450, and FX 3400
8 Available on NVIDIA Quadro FX 5450, 5000 S2, 4500 X2, 4500, 3500, 3450, and 1400

The Standard for Professional Graphics

The NVIDIA Quadro® family of professional solutions for workstations delivers the fastest application performance and the highest quality graphics. Raw performance and quality are only the beginning. The NVIDIA Quadro family takes the leading computer-aided design (CAD), digital content creation (DCC), and visualization applications to a new level of interactivity by enabling unprecedented capabilities in programmability and precision. The industry’s leading workstation applications leverage this architecture to enable hardware-accelerated features not found in any other professional graphics solution.
NVIDIA Quadro Architecture Achieves Unprecedented Performance

The NVIDIA Quadro architecture takes application performance to new levels by featuring an array of parallel vertex engines, a radically new line engine, and fully programmable pixel pipelines coupled to a high-speed graphics DRAM bus. Pipeline efficiency is further multiplied by NVIDIA’s next-generation crossbar memory architecture, enabling occlusion culling, lossless depth-Z-buffer, and color compression. These elements combine to achieve unprecedented 3D performance: blazing geometry performance, lightning-fast line performance, and massive fill rates powered by superscalar pixel pipelines. However, the true measure of power is application performance. The NVIDIA Quadro architecture more than doubles the performance of the previous generation. With a pixel read-back performance of up to 2.4Gbps/sec., massive host throughput gains can be achieved for professional applications. In addition, NVIDIA Quadro graphics solutions feature NVIDIA® SLI™ technology, a revolutionary platform innovation that enables professional users to dynamically scale graphics performance, enhance image quality, and expand display real estate by combining multiple NVIDIA Quadro graphics solutions in a single system. Using dedicated scalability logic, NVIDIA SLI technology delivers new levels of performance, quality, and resolution.

Advanced Programmability Empowers a New Class of Applications

For the first time, styling and production rendering become integral functions of the design workflow, shortening the production process and enabling faster time to market. Leading this change in functionality are the major CAD and DCC application vendors. End users can take full advantage of the programmable NVIDIA Quadro architecture by enabling sophisticated shaders to simulate a virtually unlimited range of physical characteristics, such as lighting effects (dispersion, reflection, refraction, BRDF™ models) and even physical surface properties (causing effects, porosity, molded surfaces). Real-time shaders allow these effects to be combined and modified interactively, something that is impossible with simple 2D static texture maps.

Full 128-bit Floating Point Precision Delivers the Industry’s Highest Workstation Quality

Sophisticated real-time effects typically involve multiple mathematical operations that demand high precision to maintain image quality. The NVIDIA Quadro architecture features true 128-bit IEEE floating point precision (32-bit per component), resulting in the highest level of accuracy and the ultimate in visual quality. High subpixel precision is another major contributor to image quality, addressing visual anomalies that cause models to “specle” or “crack.” The NVIDIA Quadro architecture virtually eliminates this problem by providing 128-bit subpixel precision three times higher precision than the nearest competitive product. The NVIDIA Quadro family delivers true 16-bit and 32-bit floating point formats for accurately matching visual images. The 32-bit floating point precision format, an industry first and exclusive, meets the needs of cutting-edge applications. All images have a smoother, more appealing variation in color density, which increases visual realism and generates photorealistic rendered images.

Certified for the Highest Quality Experience with the Most Demanding Workstation Applications

The performance and power of the NVIDIA Quadro architecture are built on a solid foundation of quality engineering. This engineering excellence is exemplified by the NVIDIA Unified Driver Architecture (UDA), which is certified for quality by the entire spectrum of CAD and DCC applications. The true power of UDA lies in the breadth of supported products and its long-term delivery of quality and performance. All NVIDIA Quadro products, including previous generations, are continually tested and certified. This rigorous testing process results in the industry’s highest quality hardware and drivers, even with applications released long after an NVIDIA Quadro product has shipped.

Uncompromised Professional Graphics to Go

The NVIDIA Quadro FX professional solutions for mobile workstations deliver the fastest application performance and the highest quality graphics. The NVIDIA Quadro FX mobile solutions take the leading CAD, DCC, and visualization applications to a new level of interactivity on a notebook by enabling unprecedented capabilities in programmability and precision.

Features

- Dual Dual-Link Digital Display Connectors
- 1GB (1024MB) Frame Buffer Support
- NVIDIA SLI Technology
- Advanced Vertex and Pixel Programmability
- Full 128-bit Precision Graphics Pipeline
- 12-Bit Subpixel Precision
- High-Quality Full-Scene Antialiasing (FSAA)
- High Precision, Dynamic Range Imaging Technology
- Hardware-Accelerated Pixel Read-Back

Benefits

- Dual dual-link TMDS transmitters support ultra-high-resolution panels up to 3840 x 2400 on each display, with support for color management and hardware 32-bit floating point. This enables any application to deliver images with unprecedented quality.
- NVIDIA SLI technology allows the performance of multiple cards to be combined, scaling performance to unprecedented levels of industrial realism, visualization, and collaborative capabilities.
- NVIDIA Quadro G-Sync can be combined with the NVIDIA Quadro FX 5550 or 4500 to provide advanced multi-system visualization and external signal synchronization.

NVIDIA Quadro Architecture Advances Unprecedented Performance

NVIDIA Quadro FX 5500

Benefits

- Up to 2.4GB/sec. pixel read-back performance delivers massive host throughput, more than 10x the NVIDIA Quadro FX 2500M.
- Dual dual-link TMDS transmitters support ultra-high-resolution panels (up to 3840 x 2400 @ 24Hz on each dual-link TMDS transmitter).
- The NVIDIA Quadro FX 5500 empowers a new class of applications with advanced programmability of performance, quality, and resolution.
- NVIDIA SLI technology delivers new levels of performance, quality, and resolution.
- System scalability is virtually unlimited with NVIDIA® SLI™ technology.
- Unmatched performance of the previous generation.
- Superscalar pixel pipelines deliver unprecedented 3D performance: blazing depth Z-buffer, and color compression.

Revolutionizing Advanced Visualization

The NVIDIA Quadro G-Sync is an option card that delivers frame lock and gelochron functionality to unprecedented levels of industrial realism, visualization, and collaborative capabilities. The NVIDIA Quadro G-Sync can be combined with the NVIDIA Quadro FX 5550 or 4500 to provide advanced multi-system visualization and external signal synchronization.

Integrated Graphics to Video Solution for Broadcast, Video, and Film Professionals

The NVIDIA Quadro SDI solutions featuring NVIDIA PureVideo technology are ideal for on-air broadcast professionals across many applications, including virtual set, sports, and weather news systems. The NVIDIA Quadro SDI solution is the industry’s only fully integrated graphics to video out product, and will composite live video footage onto virtual backgrounds and send the result to live video for TV broadcast. The solution also allows film production and post-production professionals to preview the results of 3D compositing, editing, and color grading in real time on HD broadcast monitors. Furthermore, PureVideo delivers ultra-smooth, crisp, and vibrant HD video playback without annoying artifacts and stuttering and with minimal CPU utilization.

Features

- Hardware accelerated pixel read-back
- 1GB (1024MB) Frame Buffer Support

Benefits

- Delivers high throughput for interactive visualization of large models and high performance for real-time processing of large textures and frames, and enables the highest quality and resolution full-scene antialiasing.
- Enables NVIDIA Quadro products to be tied together via an intelligent communication protocol, resulting in true graphics scalability and levels of performance and quality.
- Enables real-time shaders to simulate a wide range of physical effects and surface properties.

Integrated Graphics to Video Solution for Broadcast, Video, and Film Professionals

The NVIDIA Quadro SDI solutions featuring NVIDIA PureVideo technology are ideal for on-air broadcast professionals across many applications, including virtual set, sports, and weather news systems. The NVIDIA Quadro SDI solution is the industry’s only fully integrated graphics to video out product, and will composite live video footage onto virtual backgrounds and send the result to live video for TV broadcast. The solution also allows film production and post-production professionals to preview the results of 3D compositing, editing, and color grading in real time on HD broadcast monitors. Furthermore, PureVideo delivers ultra-smooth, crisp, and vibrant HD video playback without annoying artifacts and stuttering and with minimal CPU utilization.

Features

- Hardware accelerated pixel read-back
- 1GB (1024MB) Frame Buffer Support

Benefits

- Delivers high throughput for interactive visualization of large models and high performance for real-time processing of large textures and frames, and enables the highest quality and resolution full-scene antialiasing.
- Enables NVIDIA Quadro products to be tied together via an intelligent communication protocol, resulting in true graphics scalability and levels of performance and quality.
- Enables real-time shaders to simulate a wide range of physical effects and surface properties.

Available NVIDIA Quadro Graphics Boards

<table>
<thead>
<tr>
<th>PCI Express</th>
<th>Ultra-High-End</th>
<th>High-End</th>
<th>Mid-Range</th>
<th>Entry-Level</th>
<th>Specialty</th>
<th>Mobile</th>
</tr>
</thead>
<tbody>
<tr>
<td>NVIDIA Quadro FX 5550</td>
<td>NVIDIA Quadro FX 4500 X2</td>
<td>NVIDIA Quadro FX 4500</td>
<td>NVIDIA Quadro FX 1400</td>
<td>NVIDIA Quadro FX 565</td>
<td>NVIDIA Quadro FX 550</td>
<td>NVIDIA Quadro FX 350</td>
</tr>
<tr>
<td>NVIDIA Quadro FX 5550</td>
<td>NVIDIA Quadro FX 4500 X2</td>
<td>NVIDIA Quadro FX 4500</td>
<td>NVIDIA Quadro FX 1400</td>
<td>NVIDIA Quadro FX 565</td>
<td>NVIDIA Quadro FX 550</td>
<td>NVIDIA Quadro FX 350</td>
</tr>
<tr>
<td>NVIDIA Quadro FX 5550 SDI</td>
<td>NVIDIA Quadro FX 5550 SDI</td>
<td>NVIDIA Quadro FX 5550 SDI</td>
<td>NVIDIA Quadro FX 5550 SDI</td>
<td>NVIDIA Quadro FX 5550 SDI</td>
<td>NVIDIA Quadro FX 5550 SDI</td>
<td>NVIDIA Quadro FX 5550 SDI</td>
</tr>
<tr>
<td>NVIDIA Quadro FX 5550 SDI</td>
<td>NVIDIA Quadro FX 5550 SDI</td>
<td>NVIDIA Quadro FX 5550 SDI</td>
<td>NVIDIA Quadro FX 5550 SDI</td>
<td>NVIDIA Quadro FX 5550 SDI</td>
<td>NVIDIA Quadro FX 5550 SDI</td>
<td>NVIDIA Quadro FX 5550 SDI</td>
</tr>
</tbody>
</table>

SPECIALTY PRODUCTS

The NVIDIA Quadro G-Sync is an option card that delivers frame lock and gelochron functionality to unprecedented levels of industrial realism, visualization, and collaborative capabilities. The NVIDIA Quadro G-Sync can be combined with the NVIDIA Quadro FX 5550 or 4500 to provide advanced multi-system visualization and external signal synchronization.