NVIDIA GeForce GTX 400 GPU Datasheet

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3D Graphics

- Full Microsoft® DirectX® 11 Shader Model 5.0 support:
  - NVIDIA PolyMorph Engine with distributed HW tessellation engines
  - BC6H and BC7 texture compression formats
  - Gather4 extensions
- OpenGL 4.0 support
- Advanced image quality features:
  - 32× coverage sample antialiasing
  - Transparent multisampling and transparent supersampling
  - 16× angle independent anisotropic filtering
  - 128-bit floating point high dynamic-range (HDR) lighting with antialiasing; 32-bit per-component floating point texture filtering and blending
- Interactive ray tracing support
- Full-speed frame buffer blending
- Advanced lossless compression algorithms for color, texture, and zdata
- Support for normal map compression
- Z-cull
- Early-Z

GPU Computing

- NVIDIA CUDA™ technology—allows the GPU cores to provide performance improvements for applications such as video transcoding, gaming, ray tracing, and physics. API support includes:
  - CUDA C
  - CUDA C++
  - DirectCompute 5.0
  - OpenCL
  - Java, Python, and Fortran
- Third Generation Streaming Multiprocessor (SM)
  - 32 CUDA cores per SM
  - Dual Warp Scheduler simultaneously schedules and dispatches instructions from two independent warps
  - 64 KB of RAM with a configurable partitioning of shared memory and L1 cache
- Second Generation Parallel Thread Execution ISA
  - Unified Address Space with Full C++ Support
  - Optimized for OpenCL and DirectCompute

  - Full IEEE 754-2008 32-bit and 64-bit precision
  - Full 32-bit integer path with 64-bit extensions
  - Memory access instructions to support transition to 64-bit addressing
  - Improved Performance through Predication
- Improved Memory Subsystem
  - NVIDIA Parallel DataCache™ hierarchy with Configurable L1 and Unified L2 Caches
  - Greatly improved atomic memory operation performance
- NVIDIA GigaThread™ Engine
  - 10x faster application context switching
  - Concurrent kernel execution
  - Out of order thread block execution

NVIDIA Technology

- NVIDIA SLI® technology—patented hardware and software technology allows up to four NVIDIA GeForce GPUs to run in parallel to scale performance and enhance image quality on today's top games.
- NVIDIA PhysX™ technology—allows advanced physics effects to be simulated and rendered on the GPU.
- NVIDIA 3D Vision™ Ready— GeForce GPU support for NVIDIA 3D Vision, bringing a fully immersive stereoscopic 3D experience to the PC.
- NVIDIA 3D Vision Surround™ Ready—scale games across 3 panels by leveraging the power of multiple GPUs in an NVIDIA SLI configuration. Combine with 3D Vision technology for the ultimate 3 panel stereoscopic 3D gaming experience.

GPU Interfaces

- Designed for PCI Express 2.0 ×16 for a peak bandwidth (counting both directions) of up to 20 gigabytes (GB) per second (PCIe 2.0 devices are backwards compatible with PCI Express 1.x devices).
- Up to 384-bit GDDR5 memory interface (memory interface width may vary by model)

Advanced Display Functionality

- Two pipelines for dual independent display
- Two dual-link DVI outputs for digital flat panel display resolutions up to 2560×1600
- Dual integrated 400 MHz RAMDACs for analog display resolutions up to and including 2048×1536 at 85 Hz
- HDMI 1.3a support including xvYCC, deep color and 7.1 digital surround sound (upgradeable to HDMI 1.4 support for 3D formats with upcoming NVIDIA 3DTV Play software. See www.nvidia.com/3dtv for more details)
- Displayport 1.1a support
- HDCP support up to 2560×1600 resolution on all digital outputs
- 10-bit internal display processing, including hardware support for 10-bit scanout
- Underscan/overscan compensation and hardware scaling

Video

- NVIDIA® PureVideo® HD technology with VP4 programmable video processor
- Decode acceleration for MPEG-2, MPEG-4 Part 2 Advanced Simple Profile, H.264, MVC, VC1, DivX (version 3.11 and later), and Flash (10.1 and later)
- Blu-ray dual-stream hardware acceleration (supporting HD picture-in-picture playback)
- Advanced spatial-temporal de-interlacing
- Noise reduction
- Edge enhancement
- Bad edit correction
- Inverse telecine (2:2 and 3:2 pull-down correction)
- High-quality scaling
- Motion Compensation
- Video color correction
- Dynamic contrast enhancement and color stretch

Digital Audio

- Support for the following audio modes:
    - Dolby Digital (AC3), DTS 5.1, Multi-channel (7.1) LPCM, Dolby Digital Plus (DD+), MPEG2/MPEG4 AAC
- Data rates of 44.1 KHz, 48 KHz, 88.2 KHz, 96 KHz, 176 KHz, and 192 KHz
- Word sizes of 16-bit, 20-bit, and 24-bit

Power Management Technology

- Advanced power and thermal management for optimal acoustics, power, and performance based on usage:
- ASPM power management
- Adaptive Clocking
- Adaptive Power States
- Advanced fan control and temperature monitoring

Operating Systems

- Windows 7 (32-bit and 64-bit)
- Windows Vista (32-bit and 64-bit)
- Windows XP (32-bit and 64-bit)
- Linux
- FreeBSD x86

Process Technology

- 3.0 billion transistors in 40 nm process technology

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