

### Overview

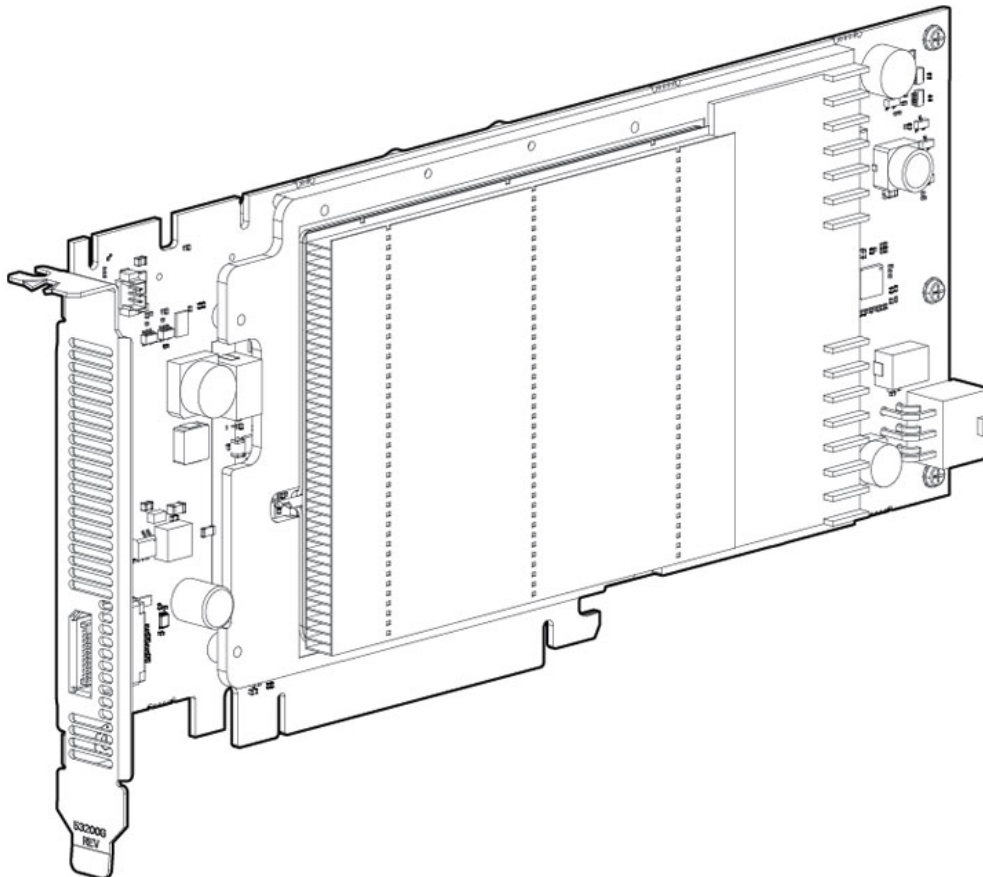
HP supports, on the HP ProLiant WS460c Workstation Blade, computational accelerator modules based on AMD® FireStream™ Graphical Processing Unit (GPU) technology.

The following FireStream Computing Module is available from HP, for use in the HP ProLiant WS460c G6 Workstation Blade

- AMD FireStream 9350 1-Slot Passive Module

The FireStream 9350 Computing Module enables seamless integration of GPU computing with HP ProLiant Workstation Blades for high-performance computing and large data center, scale-out deployments. The FireStream 9350 offers maximum floating-point performance per slot combined with AMD's ATI FirePro™ professional graphics features. The FireStream 9350 module delivers all of the standard benefits of GPU computing while enabling maximum reliability and tight integration with system monitoring and management tools such as HP Cluster Management Utility. The FireStream 9350 is the ideal inexpensive solution for customers who want to deploy high performance computing in addition to advanced and remote visualization in the same datacenter.

The HP GPU Ecosystem includes HP Cluster Platform specification and qualification, HP-supported GPU-aware cluster software, and also third-party GPU-aware cluster software for FireStream modules on HP ProLiant Workstation Blades. In particular, the HP Cluster Management Utility (CMU) will monitor and display GPU health sensors such as temperature. CMU will also install and provision the GPU drivers and the OpenCL™ software used for programming the GPU. The HP HPC Linux Value Pack includes a GPU-enhanced version of Platform LSF, with the capability of scheduling jobs based on GPU requirements.



### Models

#### AMD Passive FireStream Modules

AMD Firestream FS9350 Compute Module

A0K01A

**NOTE:** Please see the HP ProLiant WS460c Generation 6 (G6) Workstation Blade QuickSpecs for Technical Specifications and additional information:  
[http://h18000.www1.hp.com/products/quickspecs/13429\\_div/13429\\_div.html](http://h18000.www1.hp.com/products/quickspecs/13429_div/13429_div.html)

### Standard Features

#### FireStream 9350 Compute Modules

- 1440 Stream Cores
- 18 SIMD Processors
- 40 nm fabrication process, 2.1 billion devices
- 400 Gigaflops of double-precision peak performance in each GPU
- Single precision peak performance is two Teraflops per GPU.
- GDDR5 memory optimizes performance and reduces data transfers by keeping large data sets in local memory (2 GB) that is attached directly to the GPU.
- Advanced on-chip power management. On-chip power containment limits maximum TDP.
- Passive heatsink design simplifies thermal design, eliminates moving parts and cables to reduce mean time between failures.
- The high speed PCIe Gen 2.1 data transfer maximizes bandwidth between the HP ProLiant Workstation Blade and the FireStream GPU
- AMD Core Math Library for Graphics Processors (ACML-GPU) accelerates 1D, 2D, 3D-FFT's and BLAS Level 3 functions
- OpenCL™ SDK
- HP Cluster Management Utility has incorporated the FireStream sensors into its monitoring features so that cluster-wide GPU data can be presented in real time, can be stored for historical analysis and can be easily used to set up management alerts.

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**Supported Operating Systems** RHEL 5, 6

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**Supported Servers** HP ProLiant WS460c Generation 6 (G6) Workstation Blade

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**HP Services and Support** The AMD FireStream Compute Module has one year for parts exchange only or the warranty of the server or chassis it is attached to and for which it is qualified.

Enhancements to warranty services are available for server and chassis through Flexible Care Pack services.

**NOTE:** For more information, visit HP Care Pack Services at: <http://www.hp.com/services>

### Optional Features

<b>HP High Performance Clusters</b>	HP Cluster Platforms	The AMD FireStream Compute Modules are optional components of the HP Cluster Platforms - specifically engineered, factory-integrated large-scale ProLiant clusters optimized for High Performance Computing, with a choice of servers, networks and software. Operating system options include specially priced offerings for Red Hat Enterprise Linux and Novell SLES, as well as Microsoft Windows HPC Server. Compliance to the HP Cluster Platform specification is verified using the HP Cluster Test diagnostic suite, which includes GPU diagnostics. A Cluster Platform Configurator simplifies ordering. [ <a href="http://www.hp.com/go/clusters">http://www.hp.com/go/clusters</a> ]
	HP HPC Interconnects	High Performance Computing (HPC) interconnect technologies are available for ProLiant servers as part of the HP Cluster Platform portfolio. These high-speed InfiniBand and Gigabit interconnects are fully supported by HP when integrated within an HP cluster. Flexible, validated solutions can be defined with the help of configuration tools. [ <a href="http://www.hp.com/techservers/clusters/ucp/index.html">http://www.hp.com/techservers/clusters/ucp/index.html</a> ]
	HP Cluster Management Utility	HP Cluster Management Utility (CMU) is an HP-licensed and HP-supported suite of tools that are used to manage large-scale Linux ProLiant systems. CMU includes software for the centralized provisioning, management and monitoring of nodes as well as the FireStream Compute Modules. CMU makes the administration of clusters user friendly, efficient, and effective. [ <a href="http://www.hp.com/go/cmu">http://www.hp.com/go/cmu</a> ]
	HP HPC Linux Value Pack	HP HPC Linux Value Pack (Value Pack) is an HP-licensed and HP-supported specially priced software bundle for the development and deployment of applications on HPC Cluster Platforms. Value Pack includes the Platform HPC Enterprise suite of tools including the LSF workload scheduler and the HP-MPI parallelization library. Also included are the HP Unified Parallel C compiler and the HP Shmem library, as well as the execution environments for the libraries and compiler. <a href="#">HP HPC Linux Value Pack</a>

### Third Party GPU Cluster and Development Software

More software for applications and development tools for general purpose GPU enabled systems are available every week. Examples of software available for various vendors are listed below.

- AMD Core Math Library for Graphics Processors (ACML-GPU) accelerates FFT's and BLAS-3 routines
- CAPS HMPP C and Fortran to OpenCL Compiler
- Platform LSF workload scheduler
- GPU Automatically Tuned Linear Algebra Software (GATLAS) attempts to find OpenCL matrix multiply kernels with good performance through an auto-tuning benchmark methodology.
- Vienna Computing Library is a scientific computing library written in C++ and based on OpenCL. As well as BLAS operations, it contains solvers of large systems of equations using iterative methods.
- MainConcept OpenCL H.264/AVC Encoder SDK is an OpenCL-accelerated MPEG-2, VC-1 and H.264/AVC video encoder.
- JavaCL, OpenCL.Net and Pythoncl are versions of popular programming languages
- Microsoft Windows HPC Server 2008

### Related Options

#### HP High Performance Cluster Models

HP Insight Cluster Management Utility Compute Node Flexible License	QL803B
<b>NOTE:</b> This part number can be used to purchase one certificate for multiple licenses with a single activation key. Each license is for one node (server). Customer will receive a printed end user license agreement and license entitlement certificate via physical shipment. The license entitlement certificate must be redeemed online in order to obtain a license key. <b>NOTE:</b> For additional license kits please see the QuickSpecs at: <a href="http://h18004.www1.hp.com/products/quickspecs/12612_div/12612_div.html">http://h18004.www1.hp.com/products/quickspecs/12612_div/12612_div.html</a>	
HP Insight Cluster Management Utility License and Media	BD476A
<b>NOTE:</b> Order a minimum of one license per cluster to purchase media including software and documentation, which will be delivered to the customer, and also licenses CMU management. No license key is delivered or required.	
HP Insight Cluster Management Utility Media	BD477A
<b>NOTE:</b> For additional license kits please see the QuickSpecs at: <a href="http://h18004.www1.hp.com/products/quickspecs/12612_div/12612_div.html">http://h18004.www1.hp.com/products/quickspecs/12612_div/12612_div.html</a>	
HP High Performance Computing Linux Value Pack 1 Processor Flexible	TC293B
<b>NOTE:</b> This part number can be used to purchase one certificate for multiple licenses with a single activation key. Each license is for one socket (a.k.a. processor). Customer will receive a printed end user license agreement and license entitlement certificate via physical shipment. The license entitlement certificate must be redeemed online in order to obtain a license key. <b>NOTE:</b> For additional license kits please see the QuickSpecs at: <a href="http://h18004.www1.hp.com/products/quickspecs/13485_div/13485_div.html">http://h18004.www1.hp.com/products/quickspecs/13485_div/13485_div.html</a>	
HP High Performance Computing Linux Value Pack Media Kit	TC294A
<b>NOTE:</b> This part number can be used to purchase media including software and documentation, which will be delivered to the customer. <b>NOTE:</b> For additional license kits please see the QuickSpecs at: <a href="http://h18004.www1.hp.com/products/quickspecs/13485_div/13485_div.html">http://h18004.www1.hp.com/products/quickspecs/13485_div/13485_div.html</a>	

### Technical Specifications

<b>Form Factor</b>	4.376" x 9.5"; Single Slot
<b>Number of GPUs</b>	1
<b>Double Precision floating point performance (peak)</b>	400 Gflops
<b>Single Precision floating point performance (peak)</b>	2.0 Tflops
<b>Total Dedicated Memory</b>	2GB GDDR5
<b>Memory Clock Frequency</b>	1.0 GHz
<b>Stream Cores</b>	1440
<b>Memory Bandwidth</b>	128 GB/sec
<b>Power Consumption</b>	175W TDP
<b>System Interface</b>	PCIe x16 Gen2.1
<b>Thermal Solution</b>	Passive heatsink cooled by host system airflow

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<b>Environment-friendly Products and Approach</b>	<b>End-of-life Management and Recycling</b>	Hewlett-Packard offers end-of-life HP product return, trade-in, and recycling programs in many geographic areas. For trade-in information, please go to: <a href="http://www.hp.com/go/green">http://www.hp.com/go/green</a> . To recycle your product, please go to: <a href="http://www.hp.com/go/green">http://www.hp.com/go/green</a> or contact your nearest HP sales office. Products returned to HP will be recycled, recovered or disposed of in a responsible manner.
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The EU WEEE directive (2002/95/EC) requires manufacturers to provide treatment information for each product type for use by treatment facilities. This information (product disassembly instructions) is posted on the Hewlett Packard web site at: <http://www.hp.com/go/green>. These instructions may be used by recyclers and other WEEE treatment facilities as well as HP OEM customers who integrate and re-sell HP equipment.

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