

## SUN STORAGE 16 Gb FC EXPRESSMODULE UNIVERSAL HBA

FUTURE PROOF YOUR SAN WITH UNIVERSAL HBAS, THE ULTIMATE IN PERFORMANCE FROM ORACLE

### KEY FEATURES

- Universal HBA capability: Streamlined personality changes with I/O flex allows for 16 Gb FC and 10 GbE FCoE functionality with a single networking adapter
- Support for 16 Gb, 8 Gb, and 4 Gb FC connectivity when in FC mode
- Provides industry-leading native FC performance with up to 16 Gb throughput at extremely low CPU usage and full hardware offloads
- Support for 10 Gb FCoE, 10 Gb iSCSI, and 10 Gb NIC connectivity when in FCoE mode

### KEY BENEFITS

- Flexibility with a multifunction Universal HBA: Customer selectable 16 Gb FC to 10 GbE FCoE personalities for future-proofed data centers and private clouds
- Maximum performance: Up to 1.2 million IOPS per second to support large server virtualization deployments and scalable cloud initiatives, as well as performance to match new multicore processors, SSDs, and faster PCIe 3.0 server host bus architecture
- Decreased power and cooling costs by using the fewest PCI Express lanes in PCIe 3.0 environments
- Investment protection: Compatibility with 4 Gb and 8 Gb FC infrastructures or 10 GbE networking, 10 GbE iSCSI, and Fibre Channel/FCoE software driver stack shipping on the family of converged network adapters



*Oracle's Sun Storage 16 Gb FC ExpressModule Universal HBA boasts industry-leading native Fibre Channel (FC) performance—achieving dual-port, line-rate, 16 Gb Fibre Channel throughput—at extremely low CPU usage with full hardware offloads. This HBA also has the unique capability*

*of transforming from a 16 Gb Fibre Channel host bus adapter to a 10 GbE converged network adapter that supports network interface card, Fibre Channel over Ethernet (FCoE), and iSCSI traffic.*

### High Performance

Boost your system performance with 16 Gb/sec speed and full hardware offload for storage networking protocol processing. Your next-generation data center requires the high performance capabilities of the Sun Storage 16 Gb FC ExpressModule Universal HBA. Cutting-edge 16 Gb/sec bandwidth eliminates performance bottlenecks in the I/O path with a 4x data rate improvement versus existing networking solutions. The Sun Storage 16 Gb FC ExpressModule Universal HBA delivers up to 1,200,000 IOPS for truly superior performance. Furthermore, a full hardware offload for FC/FCoE protocol processing reduces system CPU utilization for I/O operations, which leads to faster application performance and higher levels of consolidation in virtualized systems.

### Lower TCO

Reduce your data center costs through convergence with the Sun Storage 16 Gb FC ExpressModule Universal HBA. Now, one universal network adapter can do the work of a discrete FC host bus adapter and Ethernet NIC. This convergence also means fewer cables, fewer switches, less power consumption, reduced cooling, and easier LAN and SAN management. The Sun Storage 16 Gb FC ExpressModule Universal HBA supports 16 Gb FC, 10 GbE FCoE, 10 GbE iSCSI storage protocols, and includes drivers that support Oracle Solaris, Oracle Linux, and all other major operating systems.

### Investment Protection

Preserve your existing investment in Fibre Channel storage and core Ethernet switches and routers for data networking with the new Sun Storage 16 Gb FC ExpressModule Universal HBA. This converged product leverages the same software driver stacks that have been deployed and battle-hardened in millions of previous installations, and it preserves familiar FC concepts such as World Wide Names (WWNs), Fibre Channel Identifiers (FC IDs), LUN masking, and zoning.

### Oracle's Sun Storage 16 Gb FC ExpressModule Universal HBA Advantage

The Sun Storage 16 Gb FC ExpressModule Universal HBAs have been designed specifically for use in Oracle's Sun servers that utilize ExpressModules. They exceed the business requirements of the enterprise data center with higher performance, investment protection, and increased power and cooling efficiency. Oracle solves enterprise-wide business challenges

with a comprehensive offering of hardware, software, and services, providing customers with a total Oracle end-to-end solution. This Oracle end-to-end solution provides world-class interoperability testing, service, and support, as well as support for Oracle and third-party storage arrays. And, Oracle's Sun Storage 16 Gb FC ExpressModule Universal HBA architecture simplifies LAN and SAN management to improve resource use and reduce your TCO.

<b>Technical Specifications</b>	
<b>Host Bus Interface</b>	
Bus Interface	PCI Express (PCIe) 3.0 x4, PCIe 2.0 x8 (x8 physical connector)
Host Interrupts	Message Signaled Interrupts eXtended (MSI-X) and INTx
I/O Virtualization	Single Root I/O Virtualization (SR-IOV), NIC Partitioning (NPAR)
Compliance	PCI Express Base Specification, rev. 3.0 PCI Express Card Electromechanical Specification, rev. 2.0 PCI Bus Power Management Interface Specification, rev. 1.2
<b>Fibre Channel</b>	
Throughput	16 Gbps full-duplex line rate port (maximum)
Logins	Support for 2,048 concurrent logins and 2,048 active exchanges Expandable to 16 K concurrent logins and 32 K active exchanges
Port Virtualization	N_Port ID Virtualization (NPIV)
Compliance	SCSI-3 Fibre Channel Protocol (SCSI-FCP), Fibre Channel Tape (FC-TAPE) Profile, SCSI Fibre Channel Protocol-2 (FCP-2), Second Generation FC Generic Services (FC-GS-2), and Third Generation FC Generic Services (FC-GS-3)
Topology	Point-to-point (N_Port) and switched fabric (N_Port)
<b>Ethernet</b>	
Throughput	10 Gbps full-duplex line rate per port
Ethernet Frame Size	1,500 byte or 9,600 byte (jumbo frame)
Stateless Offload	<ul style="list-style-type: none"> <li>• IP, TCP, and UDP checksum offloads</li> <li>• Large and giant send offload (LSO, GSO)</li> <li>• Large receive offload (LRO)</li> <li>• Receive side scaling (RSS)</li> <li>• Interrupt coalescing</li> </ul>
Compliance	IEEE: 802.3ae (10Gb Ethernet), 802.1q (VLAN) 802.3ad (Link Aggregation)2, 802.1p (Priority Encoding), 802.3x (Flow Control), IPv4 (RFQ 791), IPv6 (RFC 2460), 802.1Qbb (Priority-Based Flow Control), 802.1Qaz (DCBX/Enhanced Transmission Selection) 802.1Qau (Congestion Notification)
Topology	Any 10 Gb Ethernet Network
<b>FCoE</b>	
Logins	Support for 2,048 concurrent logins and 2,048 active exchanges

Port Virtualization	N_Port ID Virtualization (NPIV)
Performance	FCoE IOPS: Single Port: 500,000 Dual Port: 1 M
Compliance	SCSI-3 Fibre Channel Protocol (SCSI-FCP), Fibre Channel Tape (FC-TAPE) Profile, SCSI Fibre Channel Protocol-2 (FCP-2), Second Generation FC Generic Services (FC-GS-2), Third Generation FC Generic Services (FC-GS-3), FCoE & FIP (FC-BB-5)
Class of Service	Class 3
<b>iSCSI</b>	
Compliance	RFC 3720 (iSCSI), RFC 3347 (iSCSI Requirements and Design Considerations), ChaP, iSNS, SLP
<b>Tools and Utilities</b>	
Boot Support	BIOS, UEFI, FCode
APIs	SNIA HBA API V2, SMI-S
<b>Supported Operating Systems</b>	
Oracle Solaris Oracle Linux Red Hat Enterprise Linux SUSE Linux Enterprise Microsoft Windows Server	
<b>Virtualization</b>	
Oracle VM VMware	
<b>Physical Specifications</b>	
Ports	1 Dual 16 Gbps Fibre Channel
Form Factor	ExpressModule
<b>Environmental</b>	
Temperature	<ul style="list-style-type: none"> <li>Operating: 0°C/32°F to 55°C/131°F</li> <li>Storage: -20°C/-4°F to 70°C/158°F</li> </ul>
Humidity	<ul style="list-style-type: none"> <li>Relative (noncondensing): 10% to 90%</li> <li>Storage: 5% to 95%</li> </ul>
	See Table Maximum Cable Distances below.
<b>Agency</b>	
<ul style="list-style-type: none"> <li>FCC Part 15, Subpart B, Class A (U.S.)</li> <li>ICES-003 Class A (Canada)</li> <li>VCCI Class A (Japan)</li> <li>CE Mark (EU), consisting of: <ul style="list-style-type: none"> <li>EN55022:2010, Class A</li> <li>EN55024:2010</li> </ul> </li> <li>CISPR 22:2008 (International)</li> <li>UL 60950-1:2nd Edition (cURus – U.S.)</li> <li>CSA 22.2 No 60950-1-07 (cURus - Canada)</li> </ul>	

- TUV Bauart certified to EN60950-1:2006
- CB Report and Certificate to IEC 60950-1:2005 (International)
- Dimethyl Fumarate (DMF) restrictions in packaging, ref. EU Decision 2010/251/EC:
  - EU RoHS Compliant (Directive 2011/65/EU)
  - WEEE (Directive 2002/96/EC)
- China RoHS Compliant

#### Ordering Information – Part Number

- 7101681 Sun Storage Dual 16 Gb FC ExpressModule Universal HBA, QLogic (for factory installation)
- 7101682 Sun Storage Dual 16 Gb FC ExpressModule Universal HBA, QLogic
- 7101675 2 Sun Storage 16 Gb FC SW optics, QLogic (for factory installation)
- 7101676 2 Sun Storage 16 Gb FC SW optics, QLogic
- 7101677 2 Sun Storage 10 Gb FCoE SR optics, QLogic (for factory installation)
- 7101678 2 Sun Storage 10 Gb FCoE SR optics, QLogic
- 7101680 2 Sun Storage 16 Gb FC LW optics, QLogic

### Warranty

Visit [oracle.com/sun/warranty](http://oracle.com/sun/warranty) for Oracle's global warranty support information on Sun Storage products.

### Services

Visit [oracle.com/sun/services](http://oracle.com/sun/services) for information on Oracle's service program offerings for Sun Storage products.

### Contact Us

For more information about Oracle's Sun Storage 16 Gb FC ExpressModule Universal HBA, please visit [oracle.com/storage](http://oracle.com/storage) or call +1.800.786.0404 to speak to an Oracle representative.



Copyright © 2013, Oracle and/or its affiliates. All rights reserved.

This document is provided for information purposes only, and the contents hereof are subject to change without notice. This document is not warranted to be error-free, nor subject to any other warranties or conditions, whether expressed orally or implied in law, including implied warranties and conditions of merchantability or fitness for a particular purpose. We specifically disclaim any liability with respect to this document, and no contractual obligations are formed either directly or indirectly by this document. This document may not be reproduced or transmitted in any form or by any means, electronic or mechanical, for any purpose, without our prior written permission.

Oracle and Java are registered trademarks of Oracle and/or its affiliates. Other names may be trademarks of their respective owners.

Intel and Intel Xeon are trademarks or registered trademarks of Intel Corporation. All SPARC trademarks are used under license and are trademarks or registered trademarks of SPARC International, Inc. AMD, Opteron, the AMD logo, and the AMD Opteron logo are trademarks or registered trademarks of Advanced Micro Devices. UNIX is a registered trademark of The Open Group. 0613

**Hardware and Software, Engineered to Work Together**