

BCM957608-P1400GDF00

Single-Port 400 Gb/s QSFP-DD PCI Express 5.0 x16 Ethernet Network Interface Card

General Description

Based on Broadcom's scalable 400G Ethernet controller architecture, the BCM957608-P1400GDF00 1 x 400G PCIe NIC is designed to build large scale, feature-rich networking solutions in servers for AI/ML, cloud, high-performance computing, and storage applications.

The BCM957608-P1400GDF00 PCIe NIC builds upon the success of the widely deployed Broadcom architecture by combining a high-bandwidth Ethernet controller with a unique set of highly optimized hardware acceleration engines to enhance network performance and improve server efficiency.

The adapter supports fourth-generation, standards-based RDMA over Converged Ethernet (RoCE) with hardware-based congestion control. Broadcom's RoCE congestion control delivers the lowest latency in real-life scenarios and dramatically reduces the complexity of RoCE deployment at scale.

The BCM957608-P1400GDF00 PCIe adapter addresses the performance requirements of mega-scale data center networks with high throughput and advanced flow processing offloads. Features such as TruFlow™ increase virtual machine density by freeing up CPU cycles. The adapter supports technology-leading security enabling the Industry's most secure server platform with secure boot and attestation anchored in Broadcom's silicon root of trust (RoT).

Features

Network Interface:

- 8 SerDes capable of 100/50G PAM4 and 25G NRZ
- QSFP-DD 112 support
- Single-port 400/200/100/50/25G
- 400Gb/s total bandwidth
- Auto-negotiation with auto-detect
- IEEE-1588v2

Host Interface:

- 16 lanes of PCI Express 5.0
- Link rates: 32, 16, 8, 5, 2.5 GT/s
- Lane configuration: x16, x8, x4, x2, and x1
- MSI-X support

Platform Security:

- HW Secure Boot (RoT)
- Attestation (SPDM)
- OCP Secure Recovery
- Secure Wipe and Restore
- OCP Silver Security Badge (Cert Pending)

RoCEv2:

- Standards-based
- DCQCN
- Peer Memory Direct
- Smart Congestion Control: DCN and SARA
- Automated Configuration

Networking/Virtualizations and Accelerations:

- RoCEv2
- Multi-Queue, NetQueue, and VMQ
- Single Root I/O Virtualization
- VF isolation and protection
- VXLAN, GRE, NVGRE, Geneve, and IP-in-IP
- Tunnel-aware stateless off-loads
- Edge Virtual Bridging (EVB)
- Stateless TCP offloads: IP/TCP/UDP checksum, LSO, LRO, GRO, TSS, RSS, aRFS, Interrupt coalescing
- kTLS hardware offload encryption/decryption support
- QUIC hardware offload encryption/decryption support

TruFlow Flow Processing:

- Flexible matching key
- NAT and NAPT
- Tunnel encap/decap
- Custom tunnel processing
- Connection tracking
- Flow aging
- Sampling and mirroring
- Rate-limiting and metering
- Flow-based statistics
- Network Traffic Hairpin

Manageability:

- Network Controller Sideband Interface (NC-SI)
- Management Component Transport Protocol (MCTP)
- MCTP over SMBus/I²C
- MCTP over PCIe VDM
- NC-SI over MCTP
- Platform Level Data Model (PLDM): Base, Monitoring/Control & FW update

- PLDM over MCTP
- I²C support for device control and configuration

Network Boot:

- UEFI PXE boot
- UEFI L2 iSCSI boot
- UEFI support for x86

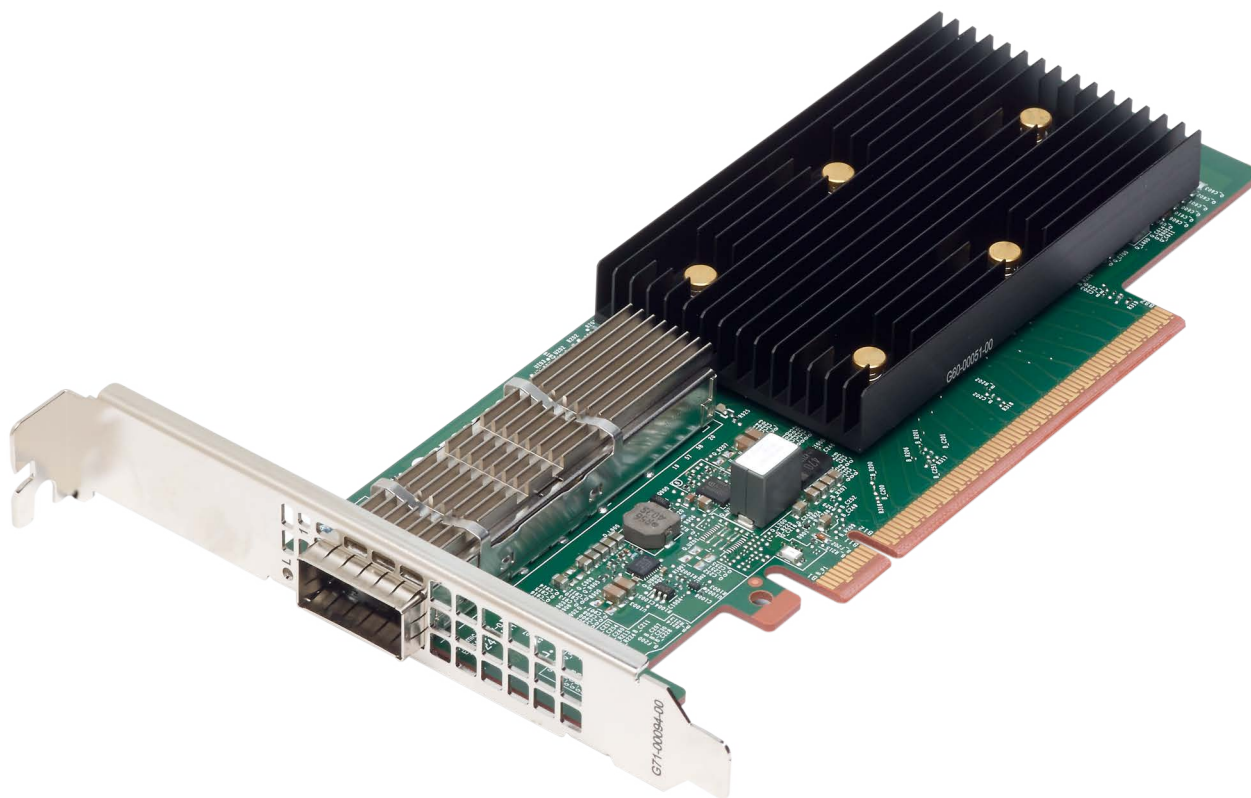
Design Specification:

Conforms to PCI-SIG CEM

Applications

- GPU server networking (scale-out and front-end)
- Artificial Intelligence (AI) and Machine Learning (ML)
- High-performance computing (HPC) Cloud and enterprise data center servers
- Network Function Virtualization
- NVMe storage disaggregation
- Storage servers

Figure 1: BCM957608-P1400GDF00 Network Interface Card



NOTE: The surface markings of the component may not reflect the product received. Broadcom reserves the right to change any component on the printed circuit board with the same functionality.

Table of Contents

1 Functional Description	4
1.1 Block Diagram	4
1.2 Host Interface Connector	5
1.3 BCM57608 Ethernet Controller	5
1.4 PCI Express Interface	5
1.5 SMBus Interface	5
1.6 NOR Flash	5
1.7 Heat Sink	5
1.8 Power Supplies	5
1.9 Network Connector	5
1.10 LED Functions and Locations	6
1.11 PCIe Plug-N-Play Identification	7
2 Board Power and Environmental Specifications	7
3 Package Weight	8
4 Physical Specifications	8
4.1 Board Physical Dimensions	8
5 Marks, Certifications, Compliance, and Safety Characteristics	9
5.1 Regulatory and Safety	9
5.2 Electromagnetic Compatibility (EMC)	9
5.3 Electrostatic Discharge (ESD) Compliance	10
5.4 VCCI – Japan	10
5.5 Taiwan BSMI Compliance	10
5.6 FCC Statement	10
5.6.1 Information to User	10
6 Ordering Information	11
Revision History	12

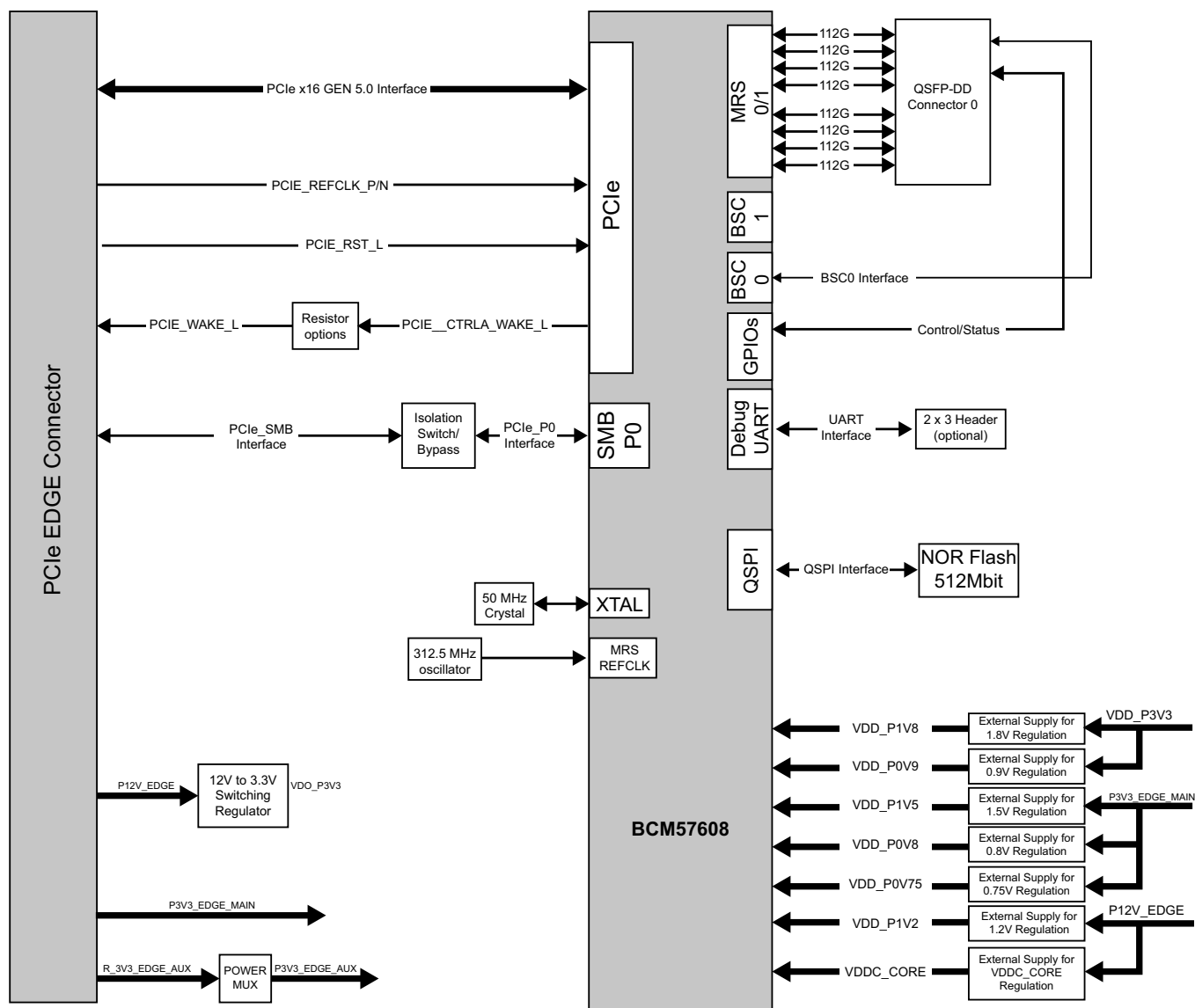
1 Functional Description

This section provides the functional description of the network interface card.

1.1 Block Diagram

Figure 2 shows the main functional blocks on the network adapter.

Figure 2: BCM957608-P1400GDF00 Block Diagram



1.2 Host Interface Connector

The network interface card is a PCI Express 5.0 x16 add-in card with full-height bracket. The card edge connector complies with the PCI Express 5.0 x16 standard pinout for add-in cards. This card conforms to the HHHL form factor.

1.3 BCM57608 Ethernet Controller

The Ethernet controller is configured as a single-port 400 Gb/s interface to the line side and x16 PCI Express v5.0 interface to the system host.

1.4 PCI Express Interface

PCIe is a serial interface standard for connecting high-speed components. The BCM57608 complies with the PCI Express Base Specification Revision 5.0, and supports a 16-lane PCIe 5.0 interface.

1.5 SMBus Interface

The Ethernet Controller SMB0 interface supports serial communications between BCM57608 and the system. The interface allows the Ethernet controller to act as a SMBus primary or secondary device.

1.6 NOR Flash

The Ethernet controller requires a SPI NOR Flash memory to store the device firmware, PCI configuration space settings (for example, device ID, vendor ID), MAC address, and so on. After power-up, the firmware is downloaded into the device memory and executed by the on-chip processor.

1.7 Heat Sink

The passive heat sink is attached to the Ethernet controller using four spring-loaded push pins that are inserted into four mounting holes.

1.8 Power Supplies

All power is derived from the network adapter card host interface connector 12V and 3.3V supply which feeds the onboard regulators that provide the necessary power to the various components on the card.

1.9 Network Connector

The controller integrates one QSFP-DD 112 connector to support 50/100G PAM-4 or 25G NRZ signaling enabling up to a 400 Gb/s port.

1.10 LED Functions and Locations

The QSFP-DD 112 port supports two LEDs to indicate traffic activities and link speed. The LEDs are visible through the cutout on the bracket as shown in [Figure 3](#).

Figure 3: Activity and Link LED Locations

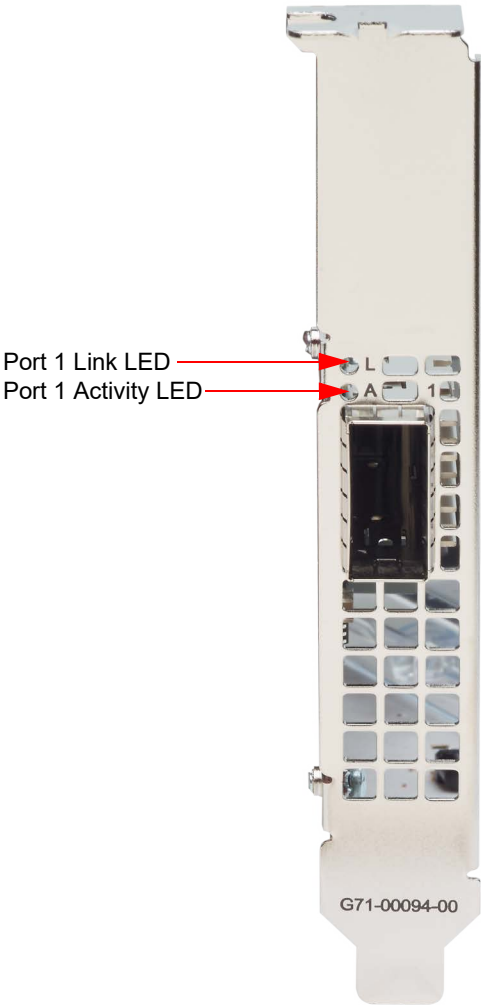


Table 1: LED Functions

LED Type	Color/Behavior	Note
Activity	Off	No Activity
	Green (blinking)	Link up (traffic flowing)
Link	Off	No Link
	Green	Linked at 200 Gb/s or 400 Gb/s
	Amber	Linked at lower speed

1.11 PCIe Plug-N-Play Identification

Table 2 provides the PCIe PNP IDs for the adapter.

Table 2: PCIe PNP IDs

Field	Value
Vendor ID	0x14E4
Device ID	0x1760
Sub-Vendor ID	0x14E4
Sub-Device ID	0x9140

2 Board Power and Environmental Specifications

Table 3 and Table 4 provide the adapter power consumption and airflow requirements for typical AI cluster use models.

Table 3: Adapter Power Consumption

Typical Power ^a	Passive DAC Cable	Linear-Drive Pluggable Optics (LPO) ^b	Active Optical Cable (AOC) ^b
50% Ethernet traffic	13.3W	16.0W	22.0W
100% Ethernet traffic	13.5W	16.2W	22.3W

a. Power consumption of adapter at 35°C ambient temperature; $T_j=40^{\circ}\text{C}$; Nominal silicon process.

b. Power consumption using a typical 3W LPO QSFP 112 and an 8W QSFP-DD 56 transceiver.

Table 4: Adapter Airflow Requirements

Ambient	Passive DAC Cable	Linear-Drive Pluggable Optics (LPO) ^a	Active Optical Cable (AOC) ^a
25°C	200 LFM	200 LFM	200 LFM
35°C	200 LFM	200 LFM	250 LFM

a. Power consumption using a typical 3W LPO QSFP 112 and an 8W QSFP-DD 56 transceiver.

The adapter is capable of supporting up to a 12W optic per connector. Using higher power optics than used in data collected for Table 3 and Table 4 will require additional airflow and slot power considerations. Evaluate these requirements and adjust system parameters accordingly.

For uses in other system architectures, please contact your Broadcom sales representative for additional information.

Table 5: Operating and Storage Conditions

Condition	Specification
Storage Humidity	10-90% RH Non-Condensing
Storage Temperature	-40 to 70°C
Operating Temperature	0 – 55°C

3 Package Weight

Table 6 shows the package weight with the pull-tab bracket installed by default (excluding the optical module).

Table 6: Package Weight

Parameter	Symbol	Value	Unit
BCM957608-P1400GDF00 weight	g	138	gram

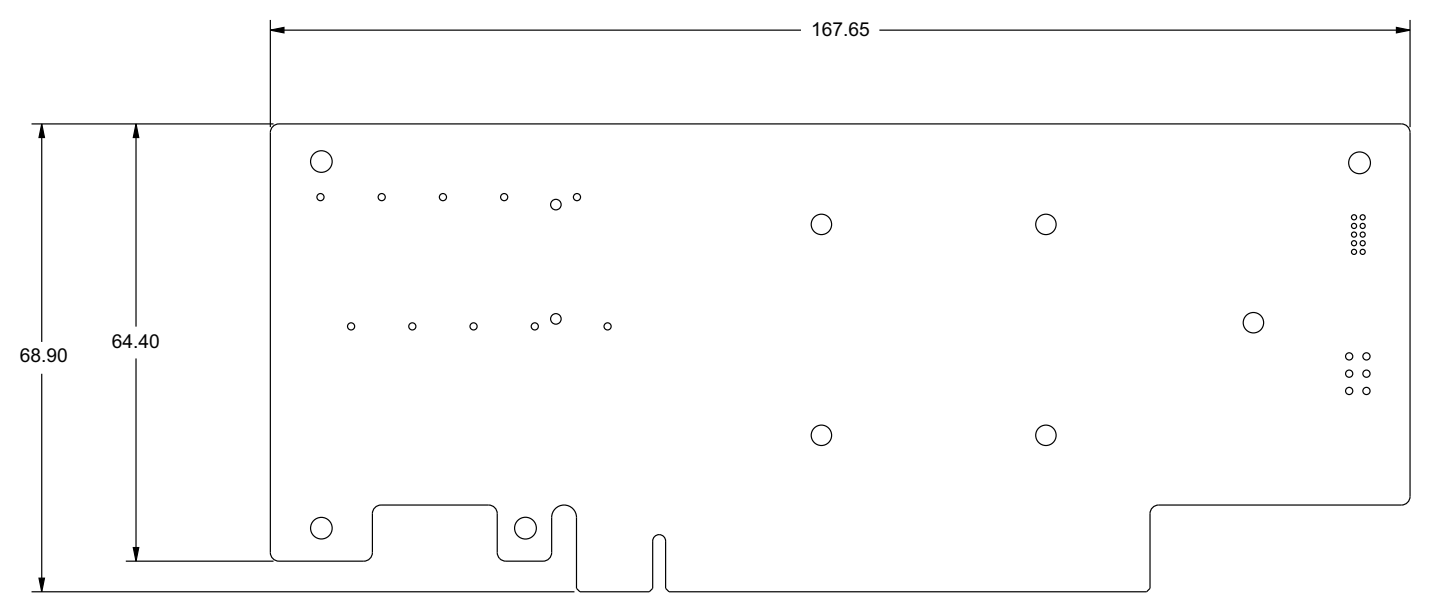
4 Physical Specifications

This section outlines the mechanical aspects of the network interface card as well as the environmental specifications.

4.1 Board Physical Dimensions

The board dimensions are shown in Figure 4. The dimensions are in millimeters with a tolerance of ±0.127 millimeters.

Figure 4: Board Physical Dimensions



5 Marks, Certifications, Compliance, and Safety Characteristics

The design and implementation of the adapter minimize electromagnetic emissions, susceptibility to radio frequency energy, and the effects of electrostatic discharge. The following adapter model shows the marks and certifications included in [Table 7](#).

Table 7: Marks and Certifications

Adapter Part Number	Model Number
BCM957608-P1400GDF00	CX150168

5.1 Regulatory and Safety

Table 8: Regulatory and Safety Approvals

Item	Applicable Standard	Approval (A)/Certificate (C)
CE/European Union	EN IEC 62368-1:2020 +A11:2020	CB report and certificate
UL/USA	IEC 62368-1 (ed. 2)	CB report and certificate

Table 9: Safety Approvals

Country	Certification Type/Standard
International	CB Scheme UL 1977 (connector safety) UL 796 (PCB wiring safety) UL 94 (flammability of parts) CSA C22.2 No. 62368-1-19, 3rd Ed

All network interface controller adapters meet or exceed the requirements of UL flammability rating 94 V0. Each bare board is also marked with the supplier name or trademark, type, and UL flammability rating. For the boards installed in a PCIe bus slot, all voltages are lower than the SELV 42.4V limit.

5.2 Electromagnetic Compatibility (EMC)

Table 10: Electromagnetic Compatibility

Standard/Country	Certification Type	Compliance
CE/EU	EN 55032:2015 +AC:2016, Class A EN 55024:2010 +A1:2015 EN 55035 EN 61000-3-2:2014 EN 61000-3-3:2013	CE report and CE DoC
FCC/USA	CFR47 Part 15 Subpart B Class A	FCC SDoC and EMC report referencing FCC standards
IC/Canada	ICES-003 Class A	Report referencing IC standards.
ACA/Australia, New Zealand	AS/NZS CISPR 32:2015, Class A	ACA certificate
BSM/Taiwan	CNS 15936:2016	BSMI certificate
BSMI/Taiwan	CNS 15663	BSMI certificate/RoHS table
KC/S.Korea	KN32 Class A KN35	Korea certificate KC mark R-R-BCM-CX150158

Table 10: Electromagnetic Compatibility (Continued)

Standard/Country	Certification Type	Compliance
VCCI/Japan	VCCI-CISP 32:2016	Copy of VCCI online certificate

5.3 Electrostatic Discharge (ESD) Compliance

Table 11: ESD Compliance Summary

Standard	Certification Type
EN55035 (EN 61000-4-2)	Air/Direct discharge

5.4 VCCI – Japan

この装置は、クラスA機器です。この装置を住宅環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。

VCCI – A

This is a Class A product. In a domestic environment, this product may cause radio interference in which case the user may be required to take adequate measures. VCCI—A.

5.5 Taiwan BSMI Compliance

警告：為避免電磁干擾，本產品不應安裝或使用於住宅環境。

Warning: To avoid electromagnetic interference, this product should not be installed or used in residential environments.

5.6 FCC Statement

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

- This device may not cause harmful interference.
- This device must accept any interference received, including interference that may cause undesired operation.

5.6.1 Information to User

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Changes or modifications not expressly approved by the manufacturer responsible for compliance could void the user's authority to operate the equipment.

6 Ordering Information

Table 12: Ordering Information

Part Number	Description
BCM957608-P1400GDF00	Single-Port 400 Gb/s QSFP-DD PCI Express 5.0 x16 Ethernet Network Interface Card, Halogen Free

Revision History

957608-P1400GDF00-DS104; October 14, 2024

Updated:

- [General Description](#) – Updated description.
- [Features](#) – Updated description.
- [Applications](#) – Updated description.
- [Figure 1, BCM957608-P1400GDF00 Network Interface Card](#) – Replaced figure.
- [Board Power and Environmental Specifications](#) – Included information on optic connectors.
- [Figure 3, Activity and Link LED Locations](#) – Replaced figure.

957608-P1400GDF00-DS103; July 29, 2024

Updated:

- Board Power and Environmental Specifications – Updated tables.

957608-P1400GDF00-DS102; December 20, 2023

Updated:

- Board Power and Environmental Specifications – Updated tables.

957608-P1400GDF00-DS101; December 6, 2023

Updated:

- Table 9, Package Weight – Added package weight
- Marks, Certifications, Compliance, and Safety Characteristics – Updated section
- Physical Specifications – Added figures of standard and low-profile brackets

957608-P1400GDF00-DS100; September 7, 2023

Initial release.

Copyright © 2023–2024 Broadcom. All Rights Reserved. The term “Broadcom” refers to Broadcom Inc. and/or its subsidiaries. For more information, go to www.broadcom.com. All trademarks, trade names, service marks, and logos referenced herein belong to their respective companies.

Broadcom reserves the right to make changes without further notice to any products or data herein to improve reliability, function, or design. Information furnished by Broadcom is believed to be accurate and reliable. However, Broadcom does not assume any liability arising out of the application or use of this information, nor the application or use of any product or circuit described herein, neither does it convey any license under its patent rights nor the rights of others.