

BCM957416A4160C

Dual-Port 10GBASE-T Ethernet PCI Express 3.0 x8 Network Interface Card

Overview

The Broadcom[®] BCM957416A4160C is a dual-port 10GBASE-T, PCIe 3.0 x8 Network Interface Card that supports a dual-port 10GBASE-T media interface that is fully compliant with the IEEE 802.3an standard. The card uses the Broadcom BCM57416 Ethernet controller with the integrated dual-channel 10GBASE-T transceiver.

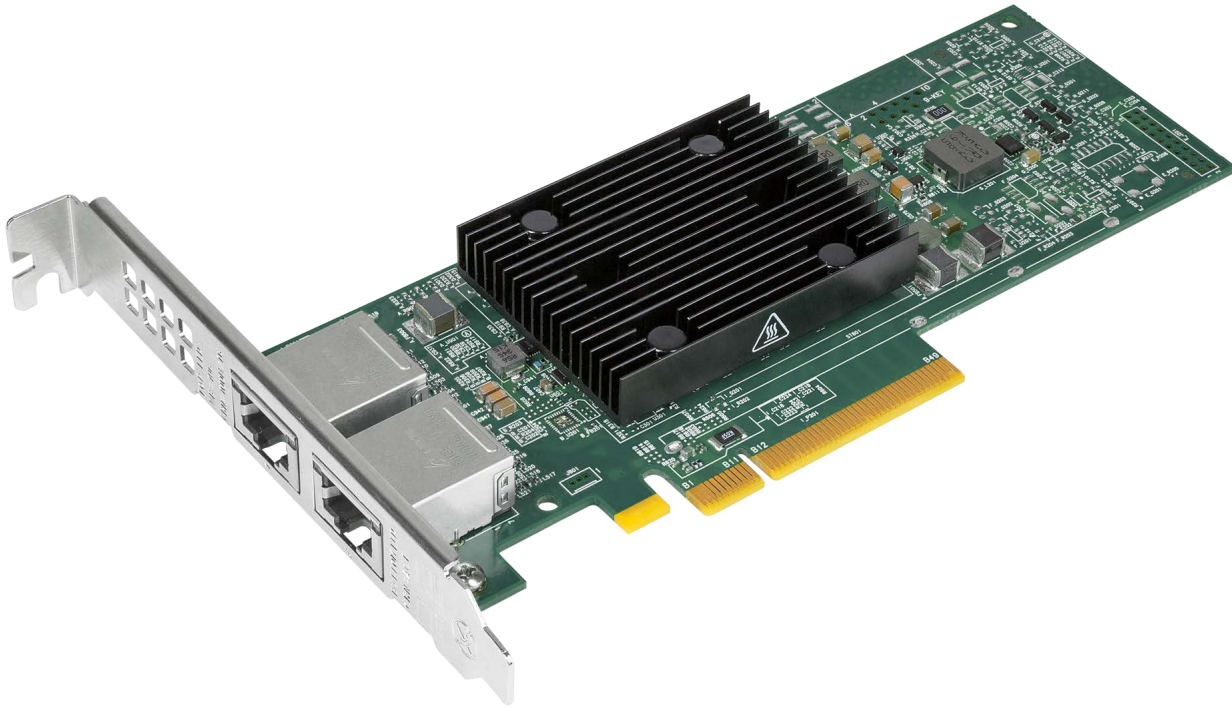
Features

- Dual-port 10-Gigabit Ethernet:
 - 10GBASE-T IEEE 802.3an
 - 1000BASE-T IEEE 802.3ab
- x8 PCI Express v3.0 compliant.
- SR-IOV with up to 128 VFs.
- Function Level Reset (FLR) support.
- TruFlow[™] flow processing engine.
- Virtual Network Termination–VXLAN, NVGRE, Geneve, GRE encap/decap.
- vSwitch acceleration.
- Tunnel-aware stateless offloads.
- DCB support: PFC, ETS, QCN, DCBx.
- RDMA over Converged Ethernet (RoCE).
- SMBus 2.0.
- MCTP over SMBus.
- PCIe-based UART and KCS.
- Jumbo frames up to 9 KB.
- Advanced Congestion Avoidance.
- Multiqueue, NetQueue, and VMQ.
- IPv4 and IPv6 offloads.
- TCP, UDP, and IP checksum offloads.
- Large Send Offload (LSO).
- Large Receive Offload (LRO).
- TCP Segmentation Offload (TSO).
- Receive-side Scaling (RSS).
- Transmit-side Scaling (TSS).
- VLAN insertion/removal.
- Interrupt coalescing.

- Network boot-PXE, UEFI.
- iSCSI boot.
- MSI and MSI-X.
- Conforms to the PCI Express Card Electromechanical Specification Rev. 3.0.

Applications

Dual-Port 10GBASE-T Ethernet Network Interface Card for Data Centers or Cloud Computing.

Figure 1: BCM957416A4160C 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.

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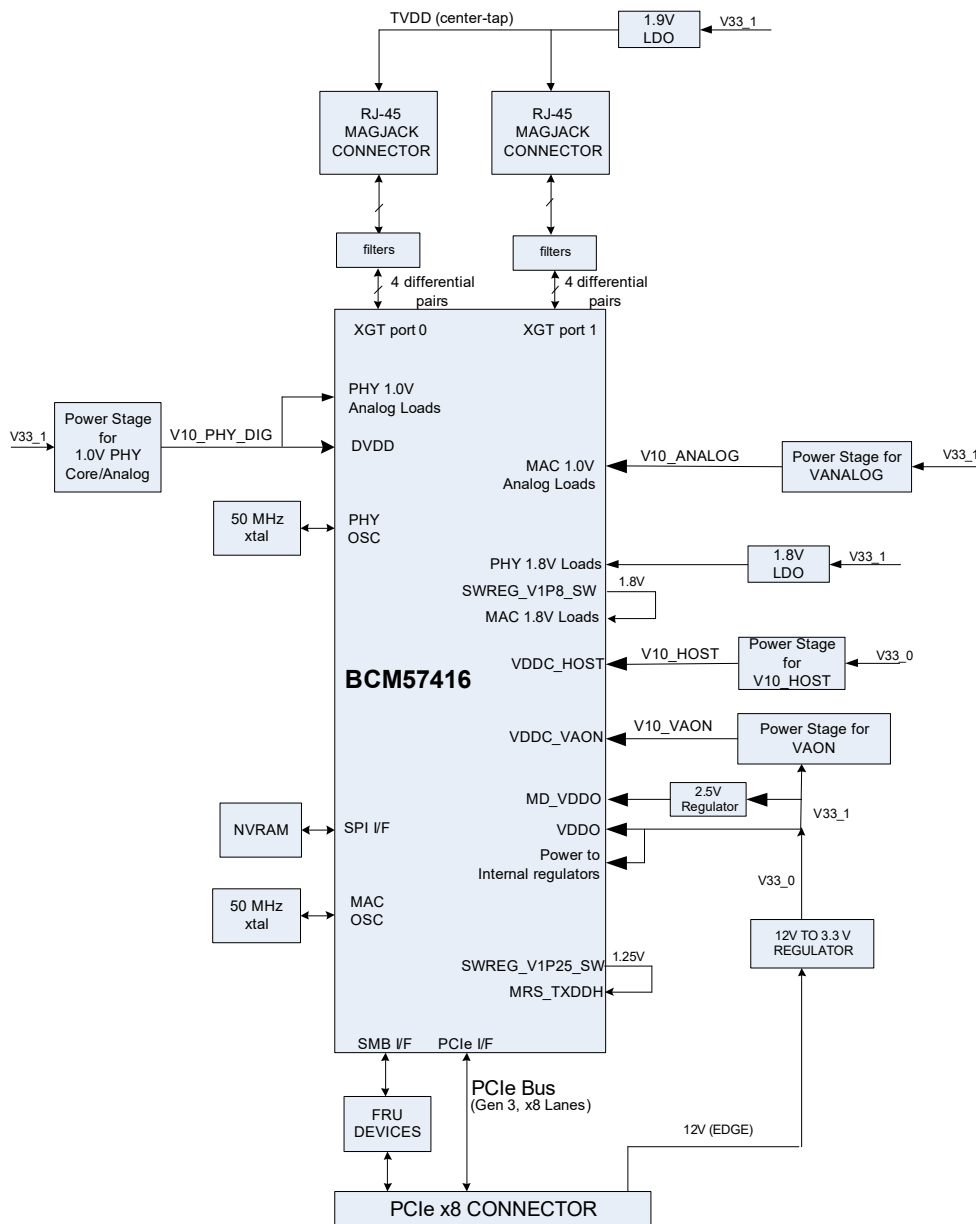
1 Functional Description

This section provides the functional description of the BCM957416A4160C network interface card.

1.1 Block Diagram

Figure 2 shows the main functional blocks on the BCM957416A4160C network interface card.

Figure 2: BCM957416A4160C Block Diagram



1.2 Host Interface Connector

The BCM957416A4160C NIC is a PCI Express Gen3 x8 add-in card with standard height bracket. The card edge connector complies with the PCI Express Gen3 x8 standard pinout for add-in cards outlined in the PCI Express Electromechanical Specification v3.0 Section 6.1, Table 6-1.

The PCIe interface is 3.0 compliant.

NOTE: See Section 6 of the PCI Express Electromechanical Specification v3.0 for more details on the card edge connector pinout, and Section 9 for add-in card mechanical information.

1.3 BCM57416

The BCM57416 Ethernet Controller is configured as a dual-port 10 Gb/s MAC with integrated 10GBASE-T Ethernet transceiver to the line side and x8 PCI Express v3.0 interface to the system host.

1.4 Internal Clocks

The BCM57416 has an integrated differential oscillator circuit that operates from the external 50 MHz crystals. The 50 MHz clock source is used to generate the clock frequencies for the device's internal circuitries.

1.5 SMBus Interface

The BCM57416 Ethernet Controller SMB0 interface supports serial communications between BCM57416 and the system. The interface allows the Ethernet Controller to act as a SMBus primary or a secondary device.

1.6 Nonvolatile RAM

The BCM57416 Ethernet Controller requires a nonvolatile serial flash memory (NVRAM) 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 insert into four mounting holes.

To prevent damage to the BCM57416 Ethernet Controller in the event of a missing heat sink, the Network Interface Card is not allowed to power up.

1.8 DC/DC Regulators

The onboard voltage regulators use the 12V edge main power from the host interface connector to derive the necessary power rails for different circuits and components on the board.

1.9 Power Supplies

All power is derived from the PCI Express Host Interface Connector 12V supply pins. These voltage supply pins feed on-board regulators that provide the necessary power to the various components on the card. The NIC has nine switching regulators, which power the card's various +1.0V, +1.25V, +1.8V, 1.9V, 2.5V, and +3.3V loads. The 3.3V power (+3.3V) and 3.3V auxiliary power (3.3V_{aux}) from the PCIe edge connector are also used to supply the power control logic and signals.

1.10 LED Functions and Locations

The 10GBASE-T 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](#). The LED functionality is described in [Table 1](#).

Figure 3: Activity and Link LED Locations

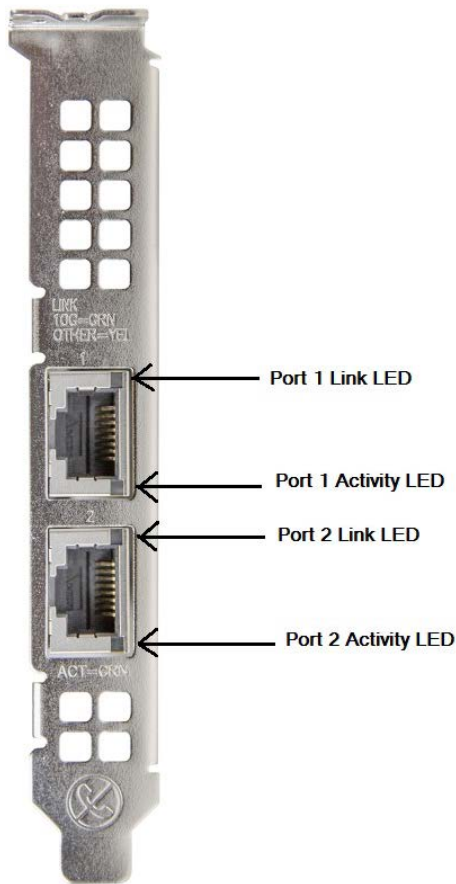


Table 1: LED Functions

| LED Type | Color/Behavior | Note |
|----------|----------------|--------------------------|
| Activity | Off | No Activity |
| | Green blinking | Traffic Flowing Activity |
| Link | Off | No Link |
| | Green | Linked at 10 Gb/s |
| | Yellow | Linked at 1 Gb/s |

2 Regulatory and Safety Approvals

The following sections detail the Regulatory, Safety, Electromagnetic Compatibility (EMC), and Electrostatic Discharge (ESD) standard compliance for the BCM957416A4160C network interface card.

2.1 Regulatory

Table 2: Regulatory Approvals

| Item | Applicable Standard | Approval (A)/Certificate (C) |
|-------------------|---------------------|------------------------------|
| CE/European Union | EN 62368-1:2014 | CB report and certificate |
| UL/USA | IEC 62368-1 (ed. 2) | CB report and certificate |

2.2 Safety

Table 3: Safety Approvals

| Country | Certification Type/Standard | Compliance |
|---------------|---|------------|
| International | CB Scheme ICES 003—Digital Device UL 1977 (connector safety) UL 796 (PCB wiring safety) UL 94 (flammability of parts) | Yes |

2.3 Electromagnetic Compatibility (EMC)

Table 4: Electromagnetic Compatibility

| Standard/Country | Certification Type | Compliance |
|----------------------------|--|--|
| CE/European Union | EN 55032:2012/AC:2013 Class B EN 55024:2010 EN 61000-3-2:2014 EN 61000-3-3:2013 | CE report and CE DoC |
| FCC/USA | CFR47 Part 15 Subpart B Class B | FCC/IC DoC and EMC report referencing FCC and IC standards |
| IC/Canada | ICES-003 Class B | FCC/IC DoC and report referencing FCC and IC standards |
| ACA/Australia, New Zealand | AS/NZS CISPR 32:2015 | ACA certificate RCM Mark |
| BSMI /Taiwan | CNS 13438 (2006) | BSMI certificate |
| BSMI /Taiwan | CNS 15663 | BSMI certificate/RoHS table |
| MIC/South Korea | KN22 Class B KN24 | Korea certificate MSIP Mark |
| VCCI/Japan | VCCI CISPR 32: 2016 | Copy of VCCI online certificate |

2.4 Electrostatic Discharge (ESD) Compliance

Table 5: ESD Compliance Summary

| Standard | Certification Type | Compliance |
|---------------------------------|----------------------|------------|
| EN 55024:2010 (EN 61000-4-2) | Air/Direct discharge | Yes |

2.5 FCC Statement

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Consult the dealer or an experienced radio/TV technician for help.

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

3 Board Power and Environmental Specifications

Table 6 provides the adapter power consumption.

Table 6: Adapter Power Consumption

| Adapter Power ^a | Power Reduction ^b Disabled | Power Reduction Enabled |
|--------------------------------|---------------------------------------|--------------------------------|
| Media | 10GBASE-T Network Cable | 10GBASE-T Network Cable |
| Typical – 50% Ethernet traffic | 15.5W | 12.9W |
| Max – 100% Ethernet traffic | 16.0W | 13.4W |

a. Power consumption of adapter at 55°C ambient temperature.

b. Reference the Broadcom Product Advisory PA-253336 for power reduction details or contact the Broadcom FAE for additional information.

Table 7 provides the adapter environmental specifications. The system designer may deploy methods to monitor the Product2_Number junction temperature (T_j) and provide sufficient airflow for keeping T_j below 105°C during normal operation.

Table 7: Adapter Environmental Specifications

| Airflow | Ambient Temperature | 10GBASE-T Network Cable |
|-----------------------|--|-------------------------|
| Hot Aisle | 55°C | 240 LFM |
| Storage Humidity | Relative Humidity Range (Non-condensing) maximum 90% at 35°C | |
| Storage Temperature | –40°C to 70°C | |
| Operating Temperature | 0°C to 55°C | |

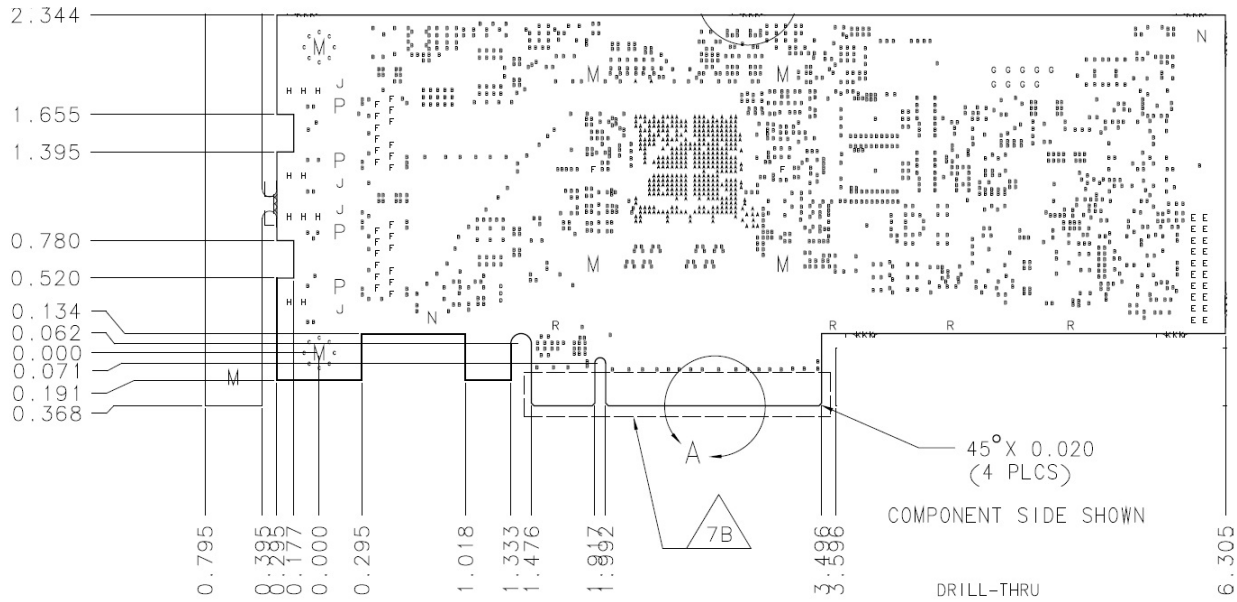
4 Board Physical Specifications

This section outlines the mechanicals of the BCM957416A4160C network interface card.

4.1 Board Physical Dimensions

The BCM957416A4160C board dimensions are shown in Figure 4. The dimensions are in inches with a tolerance of ± 0.005 .

Figure 4: Board Physical Dimensions



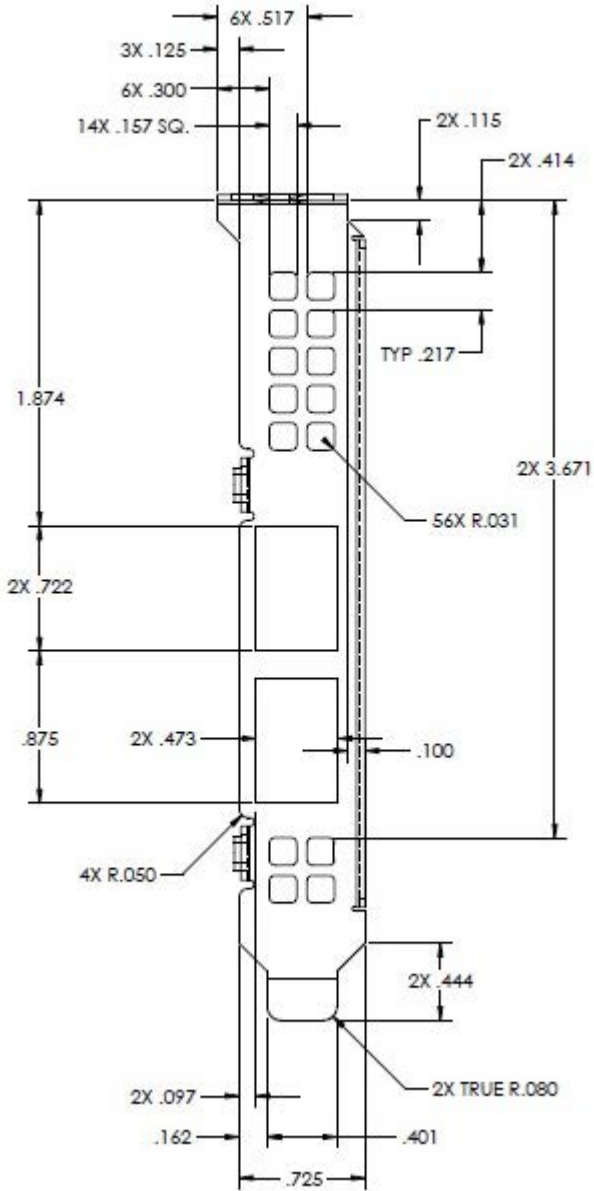
4.2 Bracket Outlines and Dimensions

The BCM957416A4160C supports both standard and low-profile brackets.

4.3 Standard-Profile Bracket Outline and Dimensions

A standard-profile bracket outline and physical dimensions are shown in [Figure 5](#).

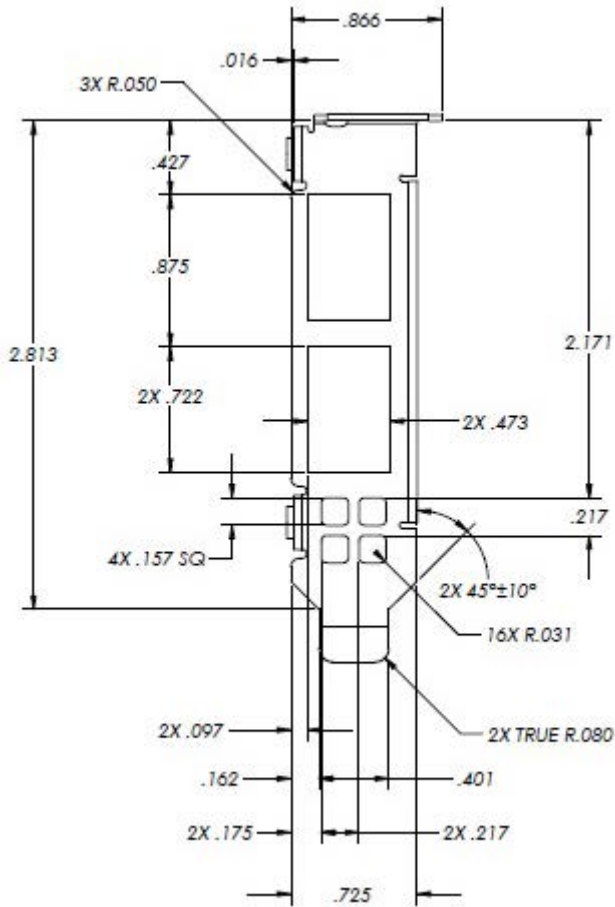
Figure 5: Standard-Profile Bracket Outline and Dimensions



4.4 Low-Profile Bracket Outline and Dimensions

A low-profile bracket outline and physical dimensions are shown in Figure 6.

Figure 6: Low-Profile Bracket Outline and Dimensions



5 Ordering Information

Table 8: Ordering Information

| Part Number | Description |
|-----------------|---|
| BCM957416A4160C | Dual-Port 10GBASE-T Ethernet PCI Express Network Interface Card; RoHS-compliant |

Revision History

957416A4160C-DS105; December 21, 2022

Added:

- [Table 6, Adapter Power Consumption](#) – Updated entire table.

957416A4160C-DS104; September 13, 2022

Added:

- Board Power and Environmental Specifications

957416A4160C-DS103; March 25, 2022

Updated:

- SMBus Interface – Updated section.

957416A4160C-DS102; January 24, 2020

Updated:

- LED Functions and Locations – Updated figure and LED functions.
- Standard-Profile Bracket Outline and Dimensions – Updated figure.
- Low-Profile Bracket Outline and Dimensions – Updated figure.

957416A4160C-DS101; December 26, 2017

Updated:

- “Regulatory and Safety Approvals” on page 9

957416A4160C-DS100; March 30, 2017

Initial release.

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