Data Sheet

BCM957412M4122C

Single-Port 25 Gb/s SFP28 Ethernet PCI Express 3.0 x8 OCP 2.0 Mezzanine Card

General Description

The Broadcom® BCM957412M4122C is a single-port 25 Gb/s PCI Express 3.0 x8 Mezzanine Card designed to the Open Compute Project (OCP) Mezzanine Card 2.0 Design Specification with a SFP28 network connector as a Type 1 adapter, with the board outline adhering to a form factor called out in v0.5 of the specification. The adapter supports both SFP28/SFP+ optical modules and copper direct-attach cables. The card uses the Broadcom BCM57412 25GbE MAC controller with an integrated single-channel 25GbE SFI transceiver.

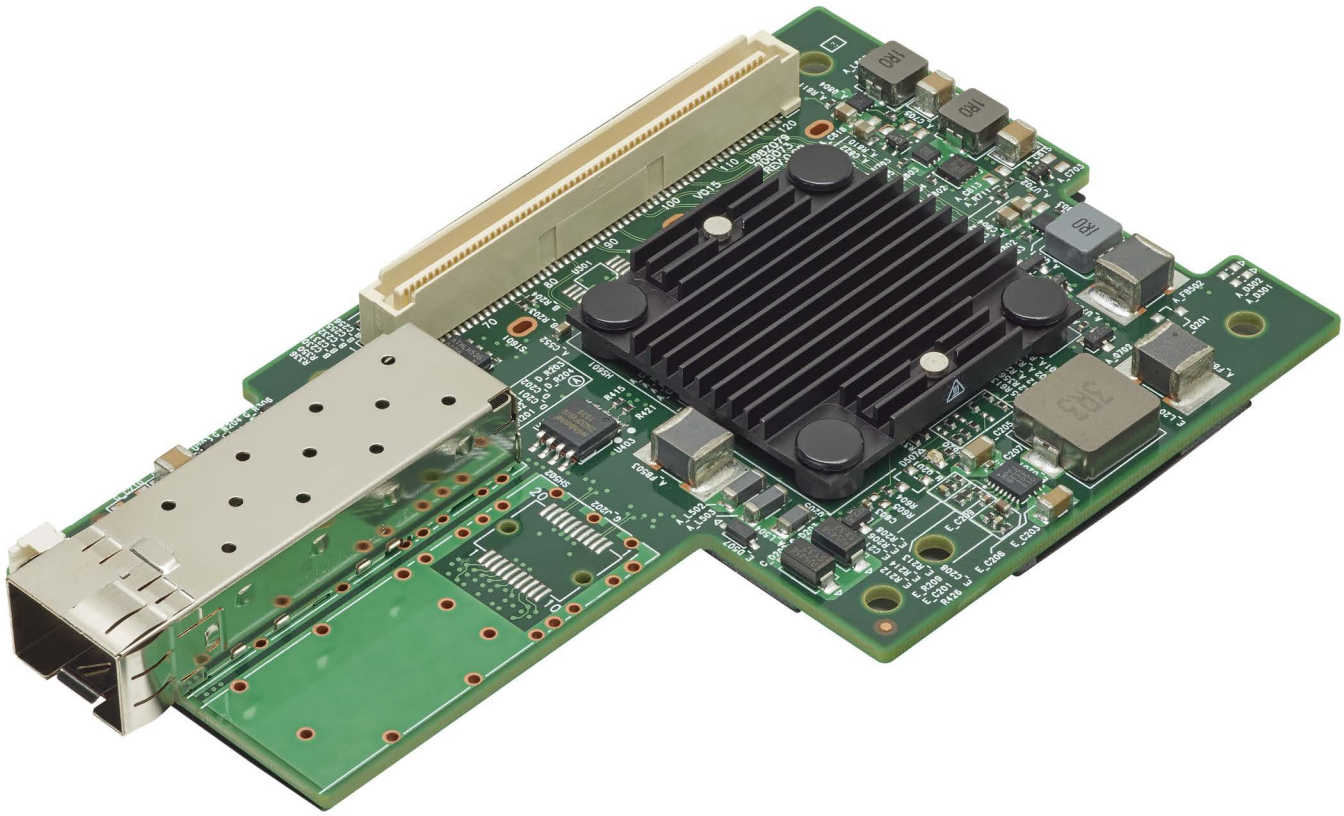
Features

- Single-port pluggable media interface, which may be equipped with 25G SFP28 or 10G SFP+ optical transceiver or with a copper direct-attach cable.
- Fully compliant with the SFF-8402 standard.
- x8 PCI Express 3.0 compliant.
- SR-IOV with up to 128 virtual functions (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)
- Network Controller Sideband Interface (NCSI).
- 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.
- Wake-on-LAN (WOL).
- MSI and MSI.X.
- Conforms to the OCP Mezzanine Card 2.0 Design Specification Type 1 vertical stack.

Applications

Single-Port 25-Gigabit Ethernet adapter for Open Compute Platform systems.

Figure 1: BCM957412M4122C OCP 2.0 Mezzanine 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

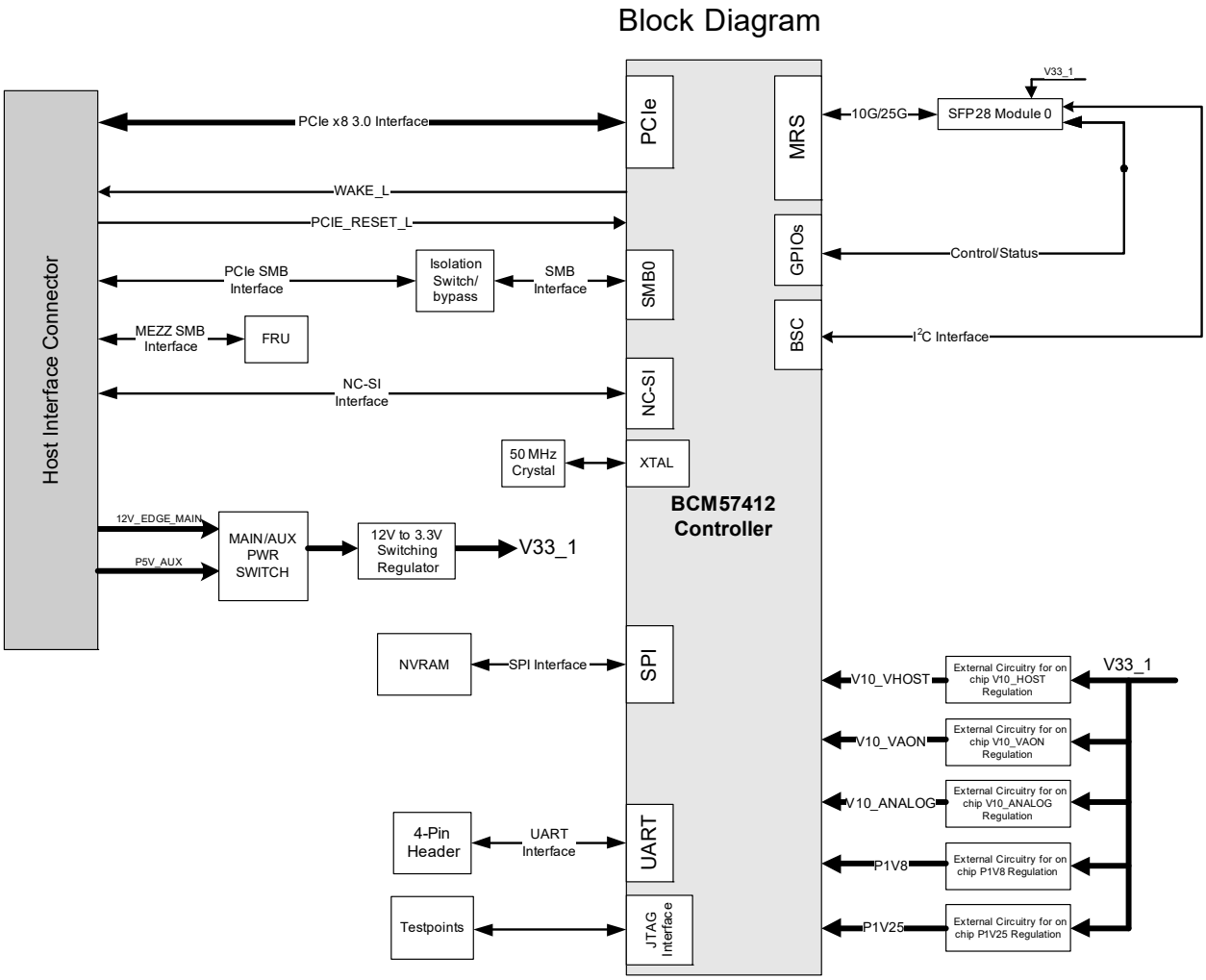
1 Functional Description

This section provides the functional description of the BCM957412M4122C OCP 2.0 mezzanine card.

1.1 Block Diagram

Figure 2 shows the main functional blocks on the BCM957412M4122C OCP 2.0 mezzanine card.

Figure 2: BCM957412M4122C Block Diagram



1.2 Host Interface Connector

The BCM957412M4122C OCP 2.0 mezzanine card interfaces with the system baseboard via a vertical-stacked card-to-card connector, FCI/61083-124402LF. The PCIe bus, NC-SI bus, SMBus interface, various other sideband signals, and power are assigned to this connector. The connector pinout complies with that of Connector A as described in the OCP Mezzanine Card 2.0 Design Specification. Table 1 shows the signal pinout. Definitions of the signals at this connector are provided in the OCP Mezzanine Card 2.0 Design Specification.

Table 1: Host Interface Connector Signal Pinout

Pin	Signal
A1	MEZZ_PRSNTA1_N/ BASEBOARD_A_ID
A2	P5V_AUX
A3	P5V_AUX
A4	P5V_AUX
A5	GND
A6	GND
A7	P3V3_AUX
A8	GND
A9	GND
A10	P3V3
A11	P3V3
A12	P3V3
A13	P3V3
A14	NCSI_RCSDV
A15	NCSI_RCLK
A16	NCSI_TXEN
A17	PERST_N0
A18	MEZZ_SMCLK
A19	MEZZ_SMDATA
A20	GND
A21	GND
A22	NCSI_RXD0
A23	NCSI_RXD1
A24	GND
A25	GND
A26	CLK_100M_MEZZ1_DP
A27	CLK_100M_MEZZ1_DN
A28	GND
A29	GND
A30	MEZZ_RX_DP<0>
A31	MEZZ_RX_DN<0>
A32	GND
A33	GND
A34	MEZZ_RX_DP<1>

Pin	Signal
A35	MEZZ_RX_DN<1>
A36	GND
A37	GND
A38	MEZZ_RX_DP<2>
A39	MEZZ_RX_DN<2>
A40	GND
A41	GND
A42	MEZZ_RX_DP<3>
A43	MEZZ_RX_DN<3>
A44	GND
A45	GND
A46	MEZZ_RX_DP<4>
A47	MEZZ_RX_DN<4>
A48	GND
A49	GND
A50	MEZZ_RX_DP<5>
A51	MEZZ_RX_DN<5>
A52	GND
A53	GND
A54	MEZZ_RX_DP<6>
A55	MEZZ_RX_DN<6>
A56	GND
A57	GND
A58	MEZZ_RX_DP<7>
A59	MEZZ_RX_DN<7>
A60	GND
A61	P12V_AUX/P12V
A62	P12V_AUX/P12V
A63	P12V_AUX/P12V
A64	GND
A65	GND
A66	P3V3_AUX
A67	GND
A68	GND
A69	P3V3

Pin	Signal
A70	P3V3
A71	P3V3
A72	P3V3
A73	GND
A74	LAN_3V3STB_ALERT_N
A75	SMB_LAN_3V3STB_CLK
A76	SMB_LAN_3V3STB_DAT
A77	PCIE_WAKE_N
A78	NCSI_RXER
A79	GND
A80	NCSI_TXD0
A81	NCSI_TXD1
A82	GND
A83	GND
A84	CLK_100M_MEZZ0_DP
A85	CLK_100M_MEZZ0_DN
A86	GND
A87	GND
A88	MEZZ_TX_DP_C<0>
A89	MEZZ_TX_DN_C<0>
A90	GND
A91	GND
A92	MEZZ_TX_DP_C<1>
A93	MEZZ_TX_DN_C<1>
A94	GND
A95	GND
A96	MEZZ_TX_DP_C<2>
A97	MEZZ_TX_DN_C<2>
A98	GND
A99	GND
A100	MEZZ_TX_DP_C<3>
A101	MEZZ_TX_DN_C<3>
A102	GND
A103	GND
A104	MEZZ_TX_DP_C<4>

Pin	Signal
A105	MEZZ_TX_DN_C<4>
A106	GND
A107	GND
A108	MEZZ_TX_DP_C<5>
A109	MEZZ_TX_DN_C<5>
A110	GND
A111	GND
A112	MEZZ_TX_DP_C<6>
A113	MEZZ_TX_DN_C<6>
A114	GND
A115	GND
A116	MEZZ_TX_DP_C<7>
A117	MEZZ_TX_DN_C<7>
A118	GND
A119	GND
A120	MEZZ_PRSNTA2_N

1.3 BCM57412

The BCM57412 Ethernet Controller is configured as single-port 25 Gb/s MAC with integrated SFP28 interface to the line side and x8 PCI Express 3.0 interface to the system host.

1.4 PCI Express Interface

PCIe is a high-bandwidth serial bus providing a low pin-count interface as an alternative to parallel PCI. It is part of the Host Interface Connector. The BCM57412 complies with the PCI Express Base Specification Revision 3.0, and supports an 8-lane PCIe 3.0 interface via the host interface connector.

1.5 NC-SI Interface

The BCM57412 Ethernet Controller supports the Network Controller Sideband Interface (NC-SI) Specification version 1.1.0. The NC-SI provides a standardized interface between the system Baseboard Management Controller (BMC) and the integrated NC-SI module of the BCM57412.

1.6 SMBus Interface

The BCM57412 Ethernet Controller SMB0 interface supports serial communications between BCM57412 and the system. The interface allows the Ethernet Controller to act as a SMBus primary or a secondary device.

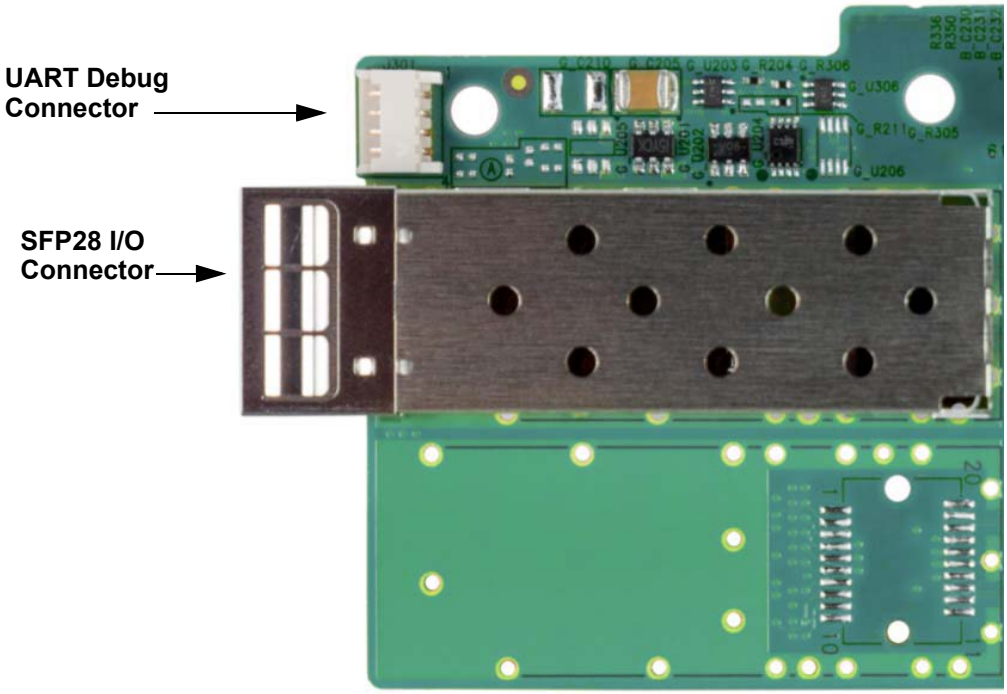
1.7 UART Interface

The BCM57412 Ethernet Controller has an integrated UART interface that supports external access to its registers. The UART signals are brought out to the 4-pin header for connecting a remote access host. The UART debug connector is placed near the I/O connector to be accessible from outside, for ease of in-system debug.

Table 2: UART Connector Pinout

Pin	Signal
1	UART_TXD
2	UART_RXD
3	V33
4	GND

Figure 3: UART Debug Connector



1.8 Nonvolatile RAM

The BCM57412 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.

1.9 Heat Sink

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

1.10 DC/DC Regulators

The onboard voltage regulators use the 12V edge power or 5V auxiliary supply from the host interface connector to derive the necessary power rails for different circuits and components on the board.

1.11 Power Supplies

All power is derived from the Mezzanine Card Host Interface Connector 12V/5V supply pins. These voltage supply pins feed on-board regulators that provide the necessary power to the various components on the card. The mezzanine card has six switching power supplies that power the card’s various +1.0V, +1.25V, +1.8V, and +3.3V loads.

1.12 LED Functions and Locations

The SFP28 port supports two LEDs to indicate traffic activities and link speed. The LEDs are visible on the bottom side as shown in Figure 4. Its locations and form factors conform to the OCP Mezzanine Card 2.0 Design Specification.

Figure 4: Activity and Link LED Locations

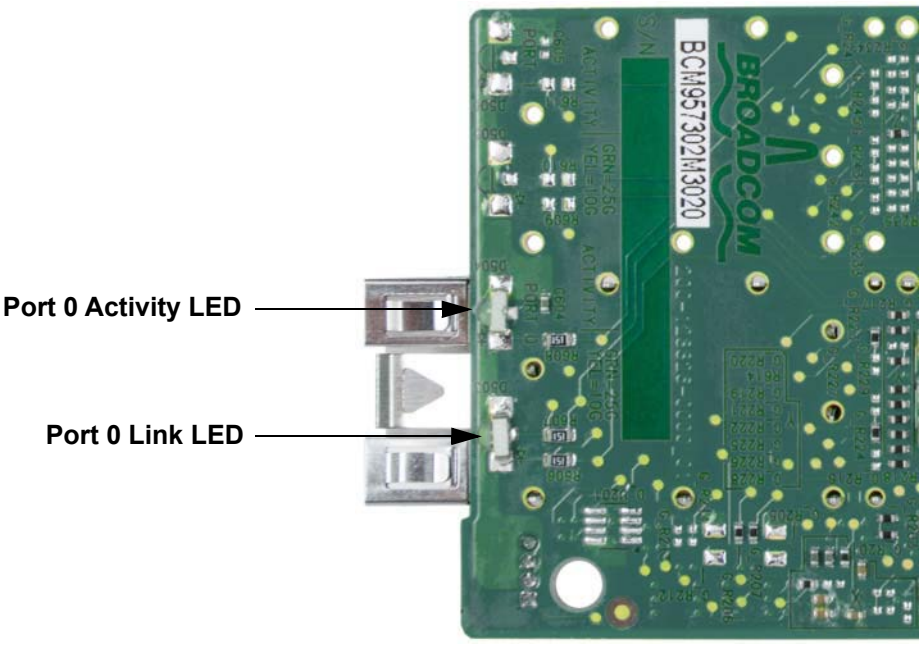


Table 3: LED Functions

LED Type	Color/Behavior	Note
Activity	Off	No Activity
	Green	Traffic Flowing Activity
Link	Off	No Link
	Green	Linked at 25 Gb/s
	Yellow	Linked at 10 Gb/s or 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 BCM957412M4122C OCP 2.0 Mezzanine Card.

2.1 Regulatory

Table 4: 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 5: 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 6: Electromagnetic Compatibility

Standard/Country	Certification Type	Compliance
CE/EU	EN 55032:2012/AC:2013 Class A 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 A	FCC/IC DoC and EMC report referencing FCC and IC standards
IC/Canada	ICES-003 Class A	FCC/IC DoC and report referencing FCC and IC standards
ACA/Australia, New Zealand	AS/NZS CISPR 22:2009 +A1:2010	ACA certificate RCM mark
BSM/Taiwan	CNS 13438 (2006) Class A	BSMI certificate
BSMI/Taiwan	CNS 15663	BSMI certificate/RoHS table
MSIP/S. Korea	RRL KN22 Class A KN24	Korea certificate MSIP mark
VCCI/Japan	VCCI-CISPR 32:2016	Copy of VCCI online certificate

2.4 Electrostatic Discharge (ESD) Compliance

Table 7: 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 A 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 8 provides the adapter power consumption.

Table 8: Adapter Power Consumption

Adapter Power[a]	Passive DAC Cable	Optical Transceiver[b]
Typical – 50% Ethernet traffic	8.0W	8.7W
Max – 100% Ethernet traffic	8.5W	9.2W

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

b. Power consumption of adapter is measured using a Broadcom AFBR-735SMZ power level 1 optical transceiver. The total adapter power may vary with different optical transceivers.

Table 9 provides the adapter environmental specifications. The system designer may deploy methods to monitor the BCM57412 junction temperature (T_j) and provide sufficient airflow for keeping T_j below 105°C during normal operation. The Broadcom AFBR-735SMZ active transceiver is recommended for the application.

Table 9: Adapter Environmental Specifications

Airflow	Ambient Temperature	Passive DAC Cable	Optical Transceiver[a]
Hot Aisle	55°C	Tier 3, 145 LFM	Tier 4, 160 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		

a. Airflow requirements are measured using a Broadcom AFBR-735SMZ (power level 1, commercial temp [70°C]) optical transceivers. Check the airflow requirements of the selected optical transceivers to ensure adequate cooling to the optical transceivers.

4 Package Weight

Table 10 shows the BCM957412M4122C package weight (excluding optical module, and so on).

Table 10: Package Weight

Parameter	Symbol	Value	Unit
BCM957412M4122C weight	g	75	gram

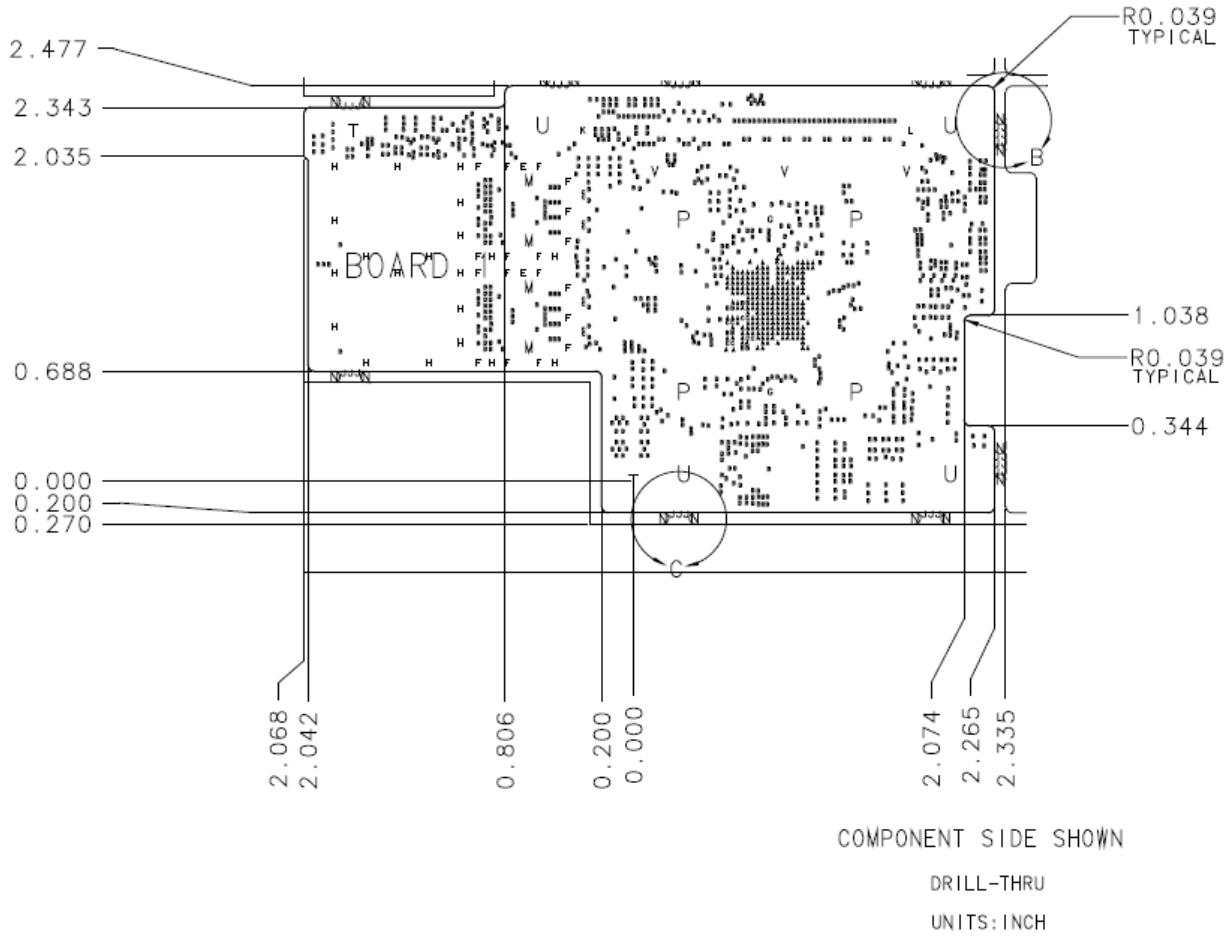
5 Physical and Environmental Specifications

This section outlines the mechanicals of the BCM957412M4122C OCP 2.0 Mezzanine Card as well as the Environmental Specifications.

5.1 Board Physical Dimensions

The BCM957412M4122C board dimensions are shown in Figure 5. The dimensions are in inches with a tolerance of ±0.005 inches.

Figure 5: Board Physical Dimensions

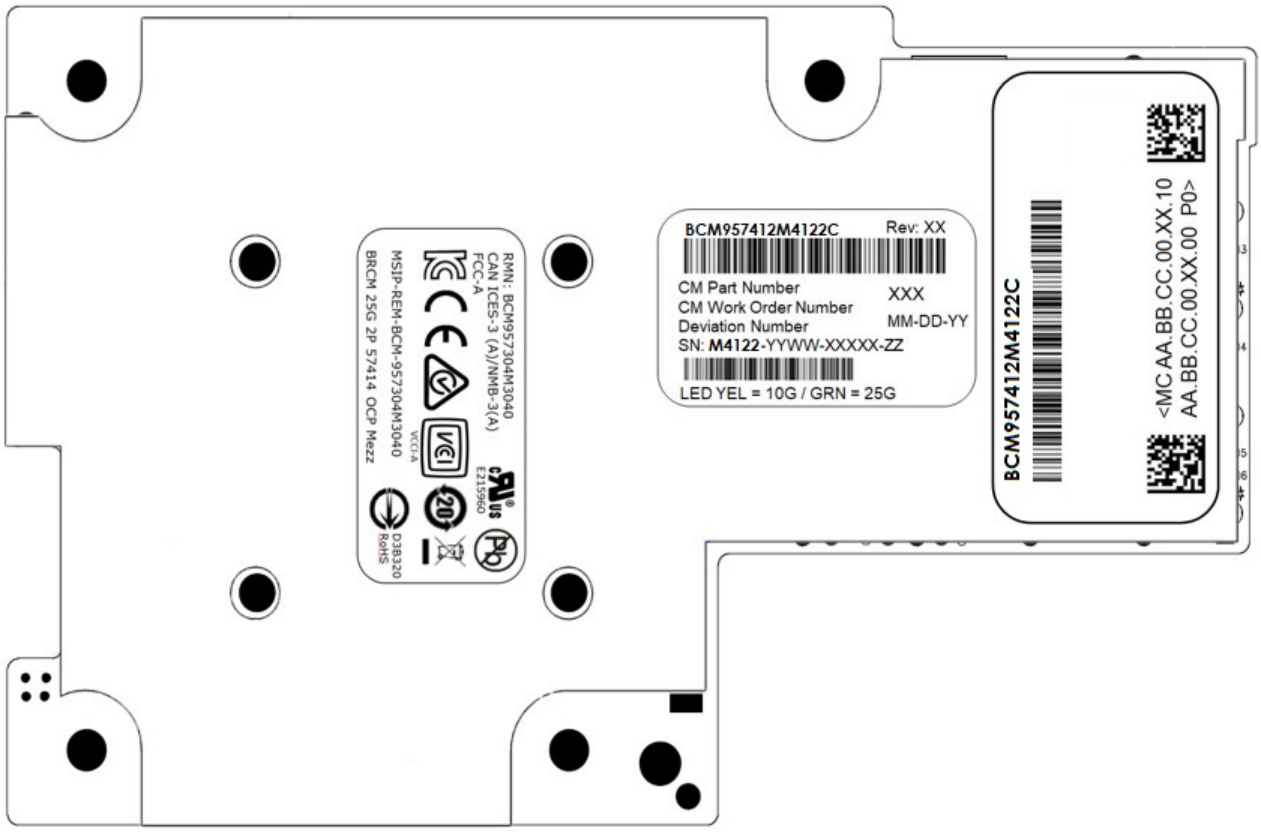


5.2 Label Information

This section provides the label information of the BCM957412M4122C OCP 2.0 Mezzanine Card. Figure 6 outlines the label and corresponding locations.

NOTE: Figure 6 is used for label locations only. The surface markings of the component may not reflect the product received. Broadcom reserves the right to change the label information on the printed circuit board with the same device functionality.

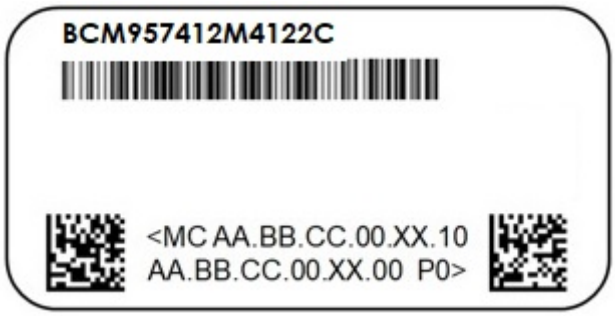
Figure 6: Labels Overview



5.2.1 MAC Address Label

In the example shown in Figure 7, BCM957412M4122C is the Part Number with 1D bar code, AA.BB.CC.00.XX.00 is the MAC address of data network interface with 2D bar code, and AA.BB.CC.00.XX.10 is the MAC address of management network interface with 2D bar code.

Figure 7: MAC Address Label



6 Ordering Information

Table 11: Ordering Information

Part Number	Description
BCM957412M4122C	Single-Port 25 Gb/s SFP28 Ethernet x8 PCI Express OCP 2.0 Mezzanine Card; RoHS-compliant

Revision History

957412M4122-DS106; March 22, 2022

Updated:

- SMBus Interface – Updated description.

957412M4122-DS105; September 3, 2021

Updated:

- Board Power and Environmental Specifications – Update section.

957412M4122-DS104; June 12, 2020

Updated:

- Label Information – Updated the label note.
- Table 11, Ordering Information – Updated ordering information description.

Added:

- Note for additional information on component surface markings in Figure 1.
- Board Power Consumption
- Airflow Requirements
- Package Weight

957412M4122-DS103; October 25, 2018

Updated:

- Table 5, Labels Overview

957412M4122-DS102; December 27, 2017

Updated:

- Regulatory and Safety Approvals

957412M4122-DS101; August 31, 2017

Updated:

- Figure 1, BCM957412M4122C OCP Mezzanine Card

957412M4122-DS100; December 8, 2016

Initial release.