

BCM957504-M1100G16

Single-Port 100 Gb/s Ethernet PCI Express v3.0 x16 OCP 2.0 Mezzanine Card

Overview

The Broadcom[®] BCM957504-M1100G16 is a single-port 100 Gb/s PCI Express v3.0 x16 network adapter card designed to the Open Compute Project (OCP) mezzanine card specification with a QSFP56 network connector. The adapter is designed to the OCP Mezzanine v2.0 specification as a Type 2 adapter with the board outline adhering to the original v0.5 dimensions. The adapter supports QSFP56/QSFP28/QSFP+ optical modules and copper direct-attach cables. The card uses the Broadcom BCM57504 100GbE MAC controller with an integrated 100GbE SFI transceiver.

Features

- Pluggable media interface, which is compatible with a QSFP56/QSFP28/QSFP+ optical transceiver or a copper direct-attach cable.
- Industry's most secure PCIe adapter solution leveraging Broadcom's BroadSAFE[®] technology
- Supports 50G PAM-4 and 25G NRZ signaling.
- Fully compliant with the SFF-8402 standard.
- PCI Express v3.0 x16 compliant.
- SR-IOV with up to 1k 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 (NC-SI).
- SMBus 2.0.
- MCTP over SMBus.
- 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.
- OCP 2.0 FRU Support.
- Conforms to the OCP Mezzanine Card Design Specification v2.0 Type 2.

Applications

- Single-port 100 Gb/s, 50 Gb/s, 40 Gb/s, 25 Gb/s, 10 Gb/s Ethernet adapter for Open Compute Platform systems.

Figure 1: BCM957504-M1100G16 OCP Mezzanine Card

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

Table of Contents

Chapter 1: Functional Description	4
1.1 Block Diagram	4
1.2 Host Interface Connectors	5
1.3 BCM57504 Ethernet Controller	8
1.4 PCI Express Interface	8
1.5 NC-SI Interface	8
1.6 SMBus Interface	8
1.7 UART Interface	9
1.8 Non-Volatile RAM	10
1.9 Heat Sink	10
1.10 Power Supplies	10
1.11 QSFP56 Connector	10
1.12 LED Functions and Locations	11
Chapter 2: Regulatory and Safety Approvals	12
2.1 Regulatory	12
2.2 Safety	12
2.3 Electromagnetic Compatibility (EMC)	13
2.4 Electrostatic Discharge (ESD) Compliance	13
2.4.1 FCC Statement	13
2.4.2 Information to User	13
Chapter 3: Physical and Environmental Specifications	14
3.1 Board Physical Dimensions	14
3.2 Board Power and Environmental Specifications	15
3.3 Package Weight	15
Chapter 4: Ordering Information	16
Appendix A: Acronyms and Abbreviations	17
Revision History	18

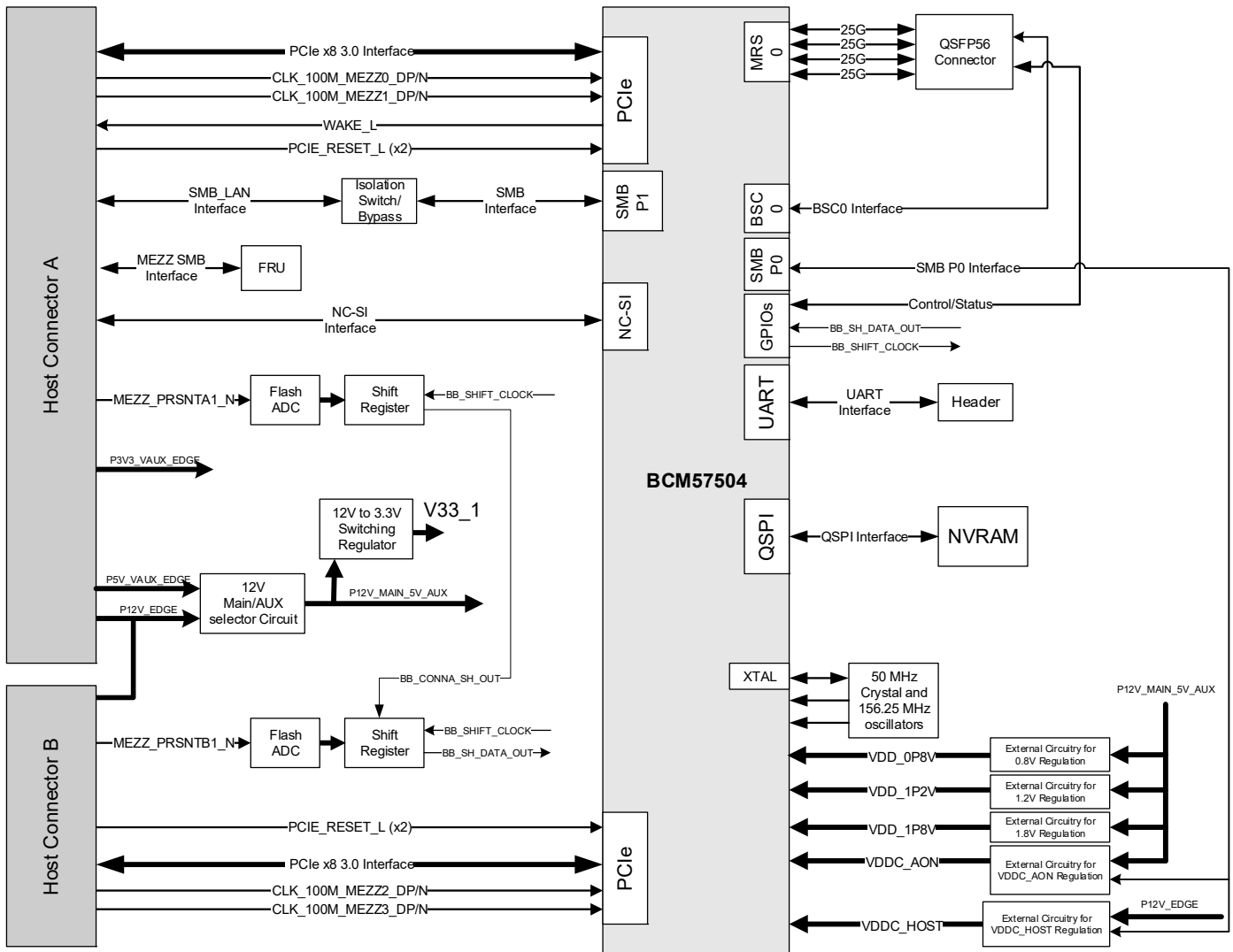
Chapter 1: Functional Description

This section provides the functional description of the BCM957504-M1100G16 OCP mezzanine card.

1.1 Block Diagram

Figure 2 shows the main functional blocks on the BCM957504-M1100G16 OCP mezzanine card.

Figure 2: BCM957504-M1100G16 Block Diagram



1.2 Host Interface Connectors

The BCM957504-M1100G16 OCP mezzanine card interfaces with the system baseboard via two vertical-stacked card-to-card connectors. The PCIe bus, NC-SI bus, SMBus interface, various other sideband signals, and power are assigned to these two connectors. The pinout complies with that of Connector A and Connector B as described in the OCP mezzanine card 2.0 Design Specification. [Table 1](#) shows the signal pinout for both connectors per the specification. Definitions of the signals at this connector are provided in the OCP Mezzanine Card Specification.

Table 1: Connector A

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_CRSDV
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>
A35	MEZZ_RX_DN<1>
A36	GND

Pin	Signal
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
A70	P3V3
A71	P3V3
A72	P3V3

Pin	Signal
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>
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>

Pin	Signal
A117	MEZZ_TX_DN_C<7>
A118	GND
A119	GND
A120	MEZZ_PRSN2A2_N

Table 2: Connector B

Pin	Signal
B1	MEZZ_PRSNB1_N/BASEBOARD_B_ID
B2	GND
B3	MEZZ_RX_DP<8>
B4	MEZZ_RX_DN<8>
B5	GND
B6	GND
B7	MEZZ_RX_DP<9>
B8	MEZZ_RX_DN<9>
B9	GND
B10	GND
B11	MEZZ_RX_DP<10>
B12	MEZZ_RX_DN<10>
B13	GND
B14	GND
B15	MEZZ_RX_DP<11>
B16	MEZZ_RX_DN<11>
B17	GND
B18	GND
B19	MEZZ_RX_DP<12>
B20	MEZZ_RX_DN<12>
B21	GND
B22	GND
B23	MEZZ_RX_DP<13>
B24	MEZZ_RX_DN<13>
B25	GND
B26	GND
B27	MEZZ_RX_DP<14>
B28	MEZZ_RX_DN<14>
B29	GND
B30	GND
B31	MEZZ_RX_DP<15>
B32	MEZZ_RX_DN<15>
B33	GND
B34	GND
B35	CLK_100M_MEZZ2_DP
B36	CLK_100M_MEZZ2_DN
B37	GND
B38	PERST_N1
B39	PERST_N2
B40	PERST_N3
B41	P12V_AUX/P12V
B42	P12V_AUX/P12V
B43	RSVD

Pin	Signal
B44	GND
B45	MEZZ_TX_DP<8>
B46	MEZZ_TX_DN<8>
B47	GND
B48	GND
B49	MEZZ_TX_DP<9>
B50	MEZZ_TX_DN<9>
B51	GND
B52	GND
B53	MEZZ_TX_DP<10>
B54	MEZZ_TX_DN<10>
B55	GND
B56	GND
B57	MEZZ_TX_DP<11>
B58	MEZZ_TX_DN<11>
B59	GND
B60	GND
B61	MEZZ_TX_DP<12>
B62	MEZZ_TX_DN<12>
B63	GND
B64	GND
B65	MEZZ_TX_DP<13>
B66	MEZZ_TX_DN<13>
B67	GND
B68	GND
B69	MEZZ_TX_DP<14>
B70	MEZZ_TX_DN<14>
B71	GND
B72	GND
B73	MEZZ_TX_DP<15>
B74	MEZZ_TX_DN<15>
B75	GND
B76	GND
B77	CLK_100M_MEZZ3_DP
B78	CLK_100M_MEZZ3_DN
B79	GND
B80	MEZZ_PRSNB2_N

1.3 BCM57504 Ethernet Controller

The BCM57504 Ethernet controller used in the BCM957504-M1100G16 card is configured for single-port 100 Gb/s operation with integrated QSFP56 optical interface to the line side and PCI Express v3.0 x16 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 BCM57504 complies with the PCI Express Base Specification Revision 4.0, and supports a 16-lane PCIe v3.0 interface via the host interface connector.

1.5 NC-SI Interface

The BCM57504 Ethernet controller supports the NC-SI specification, version 1.1.0. The NC-SI provides a standardized interface between the system BMC and the integrated NC-SI module of the BCM57504.

1.6 SMBus Interface

The BCM57504 Ethernet controller SMBus interface supports serial communications between the BCM57504 and the system. The interface allows the Ethernet controller to act as a SMBus primary or a secondary device.

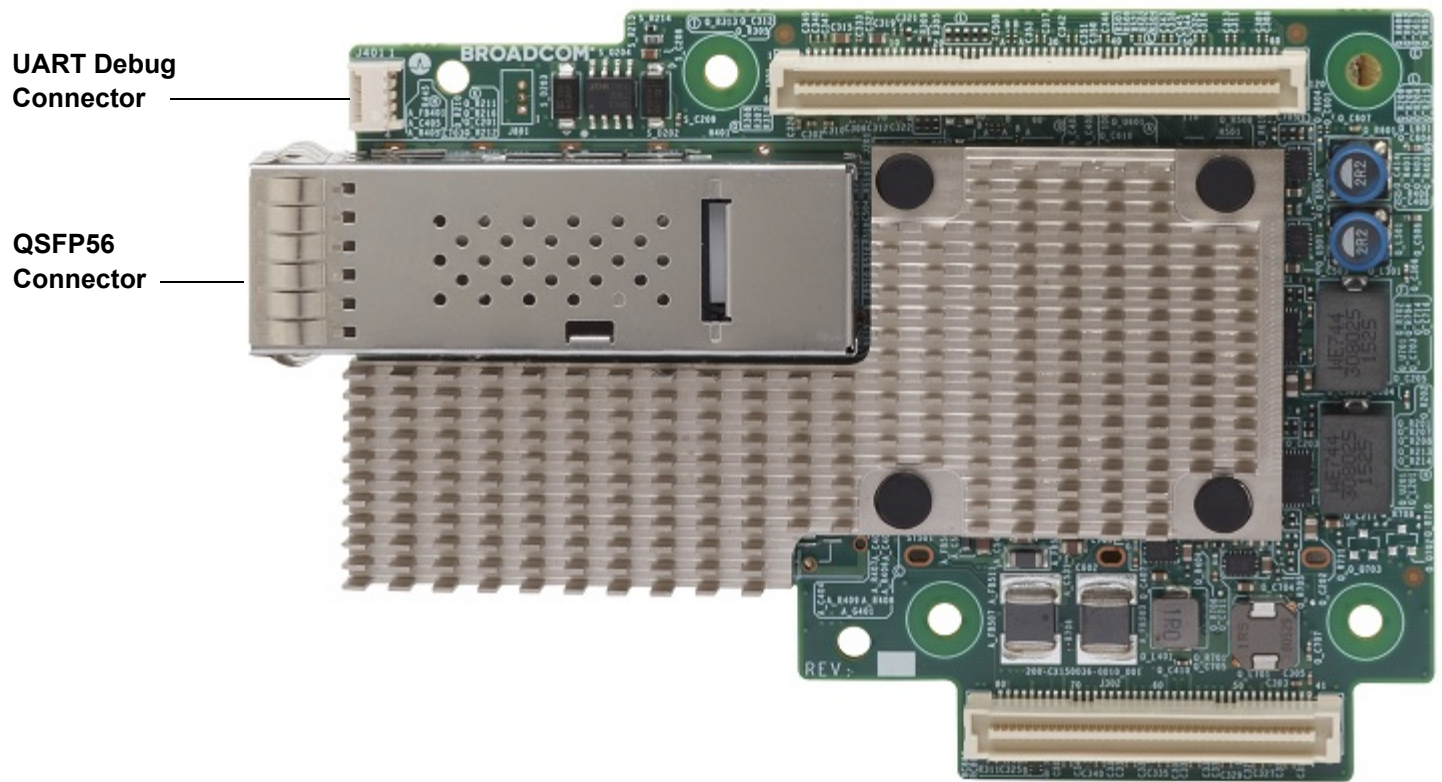
1.7 UART Interface

The BCM57504 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 and is externally accessible for ease of in-system debug.

Table 3: UART Connector Pinout

Pin	Signal
1	UART_TXD
2	UART_RXD
3	V33
4	GND

Figure 3: UART Debug Connector (TBD)



NOTE: The surface markings of the components shown in Figure 3 may not reflect the final product. Broadcom reserves the right to change any component on the printed circuit board with the same functionality.

1.8 Non-Volatile RAM

The BCM57504 Ethernet controller requires a non-volatile 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 Power Supplies

All power is derived from the mezzanine card host interface connector 12V/5V and 3.3V 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 switching power supplies that power the card's various power rails.

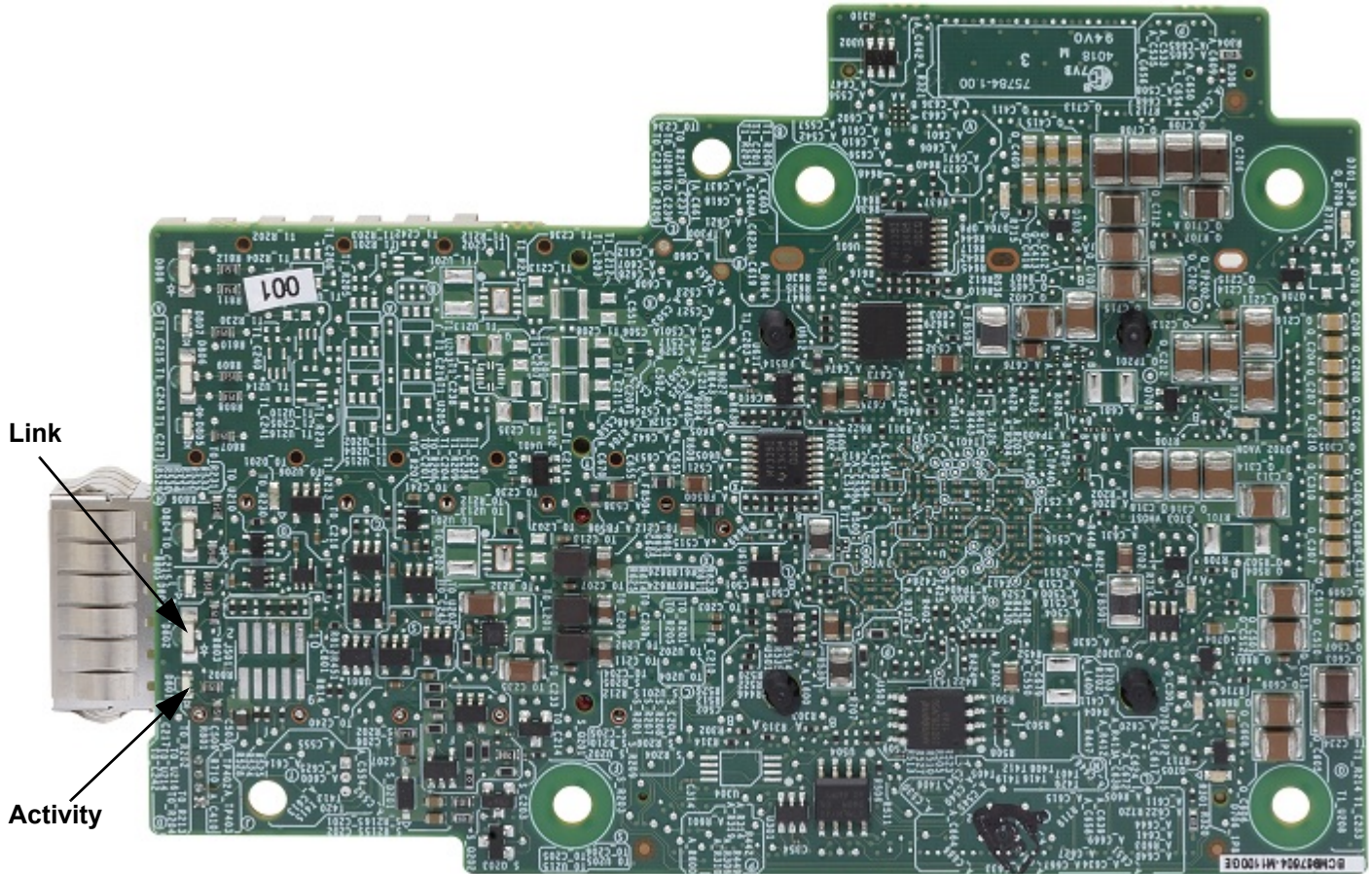
1.11 QSFP56 Connector

The BCM957504-M1100G16 integrates a QSFP56 connector to support 50G PAM-4 or 25G NRZ signaling for 100 Gb/s on the port. QSFP56 is backward-compatible to QSFP28 and QSFP+ when appropriate cables and transceivers are used.

1.12 LED Functions and Locations

The QSFP56 port supports two LEDs to indicate traffic activities and link speed. The LEDs are visible on the bottom side as shown in Figure 4. Their locations and form factors conform to the OCP mezzanine card specification.

Figure 4: Activity and Link LED Locations



NOTE: The surface markings of the components shown in Figure 4 may not reflect the final product. Broadcom reserves the right to change any component on the printed circuit board with the same functionality.

Table 4: LED Functions

NVRAM Manufacturer	Device	Mbit
Activity	Off	No Activity
	Green (blinking)	Link up (traffic flowing)
Link	Off	No link
	Green	Linked at 100 Gb/s
	Amber	Linked at lower speed

Chapter 2: Regulatory and Safety Approvals

The following sections detail the regulatory, safety, electromagnetic compatibility (EMC), and electrostatic discharge (ESD) compliance for the BCM957504-M1100G16 OCP mezzanine card.

2.1 Regulatory

Table 5: 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 6: 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 7: Electromagnetic Compatibility

Standard/Country	Certification Type	Compliance
CE/European Union	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 32:2015 Class A	ACA certificate RCM mark
BSMI/Taiwan	CNS 13438 (2006) Class A	BSMI certificate
BSMI/Taiwan	CNS 15663	BSMI certificate/RoHS table
MIC/South Korea	KN32 Class A KN35	Korea certificate R mark
VCCI/Japan	VCCI CISPR 32: 2016	Copy of VCCI online certificate

2.4 Electrostatic Discharge (ESD) Compliance

Table 8: ESD Compliance Summary

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

2.4.1 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.

2.4.2 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.

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

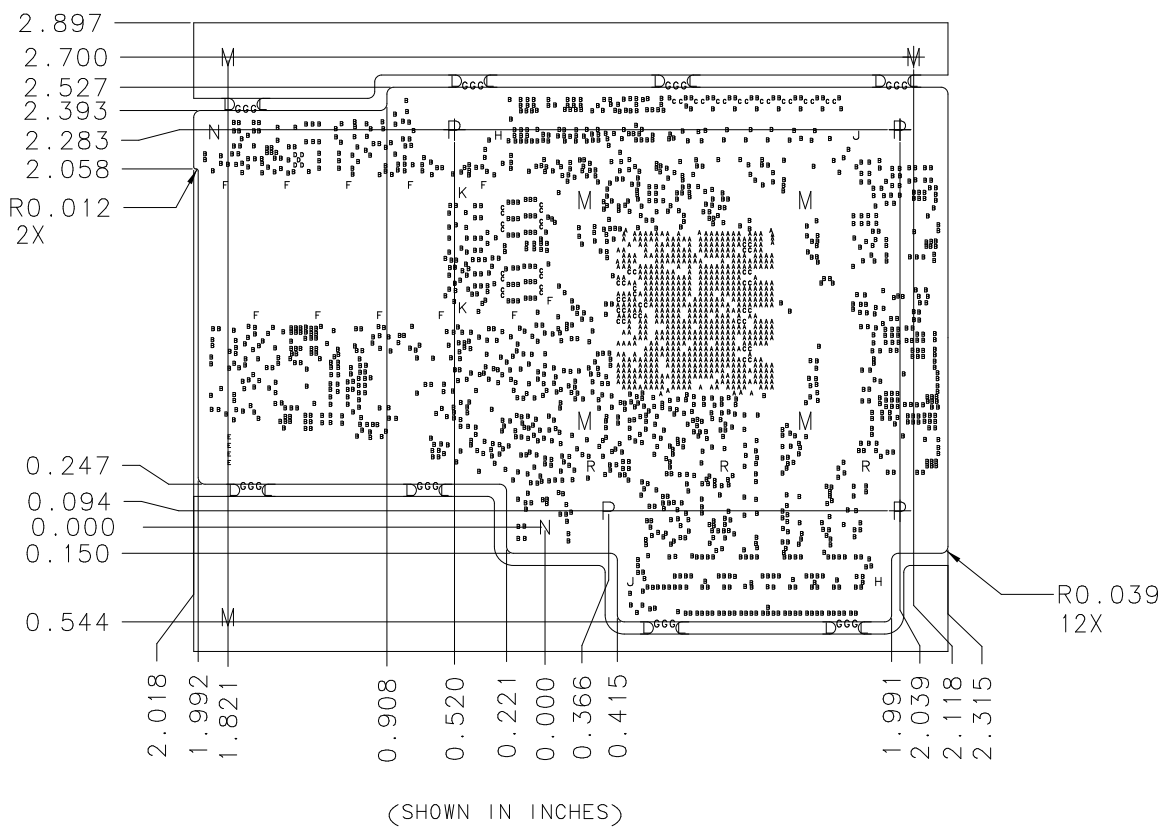
Chapter 3: Physical and Environmental Specifications

This section outlines the mechanicals of the BCM957504-M1100G16 OCP mezzanine card as well as the environmental specifications.

3.1 Board Physical Dimensions

The BCM957504-M1100G16 board dimensions are shown in Figure 5. The dimensions are in inches with a tolerance of ± 0.005 .

Figure 5: Board Physical Dimensions



3.2 Board Power and Environmental Specifications

Table 9 provides the adapter power consumption.

Table 9: Adapter Power Consumption

Adapter Power ^a	Passive DAC Cable	Optical Transceiver ^b
Typical – 50% Ethernet traffic	16.3W	18.1W
Max – 100% Ethernet traffic	16.6W	18.5W

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

b. Power consumption of adapter is measured using a Broadcom AFBR-89CDHZ power class 3 optical transceiver. The total adapter power adapter may vary with different optical transceivers.

Table 10 provides the adapter environmental specifications. The system designer may deploy methods to monitor the BCM57504 junction temperature (T_j) and provide sufficient airflow for keeping T_j below 105°C during normal operation. The Broadcom AFBR-89CDHZ Gen2 active transceiver is recommended for the application.

Table 10: Adapter Environmental Specifications

Airflow	Ambient Temperature	Passive DAC Cable	Optical Transceiver ^a
Hot Aisle	55°C	Tier 2, 50 LFM	Tier 9, 425 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-89CDHZ (power class 3, commercial temp [70°C]) optical transceiver. Check the airflow requirements of the selected optical transceivers to ensure adequate cooling to the optical transceivers.

3.3 Package Weight

Table 11 shows the BCM957504-M1100G16 package weight (excluding the DAC cable or optical module).

Table 11: Package Weight

Parameter	Symbol	Value	Unit
BCM957504-M1100G16 weight	g	109	gram

Chapter 4: Ordering Information

Table 12: Ordering Information

Part Number	Description
BCM957504-M1100G16	Single-port 100 Gb/s QSFP56 Ethernet PCI Express v3.0 x16 OCP 2.0 Mezzanine Card; Halogen-Free

Appendix A: Acronyms and Abbreviations

For a more complete list of acronyms and other terms used by Broadcom documents, go to:
<http://www.broadcom.com/press/glossary.php>.

Table 13: Acronyms and Abbreviations

Term	Description
BMC	Baseboard Management Controller
EMC	Electromagnetic Compatibility
ESD	Electrostatic Discharge
FLR	Function-Level Reset
LED	Light Emitting Diode
LRO	Large Receive Offload
LSO	Large Send Offload
NC-SI	Network Controller Sideband Interface
NVRAM	Non-volatile serial flash memory
OCP	Open Compute Project
RSS	Receive-side Scaling
TSO	TCP Segmentation Offload
TSS	Transmit-side Scaling
UART	Universal Asynchronous Receiver/Transmitter
WOL	Wake-on-LAN

Revision History

957504-M1100G16-DS104; March 4, 2022

Updated:

- [SMBus Interface](#) – Updated description.
- [Table 4, LED Functions](#) – Changed No Link to No Activity.

957504-M1100G16-DS103; September 3, 2021

Updated:

- Board Power and Environmental Specifications – Updated section.

957504-M1100G16-DS102; February 23, 2021

Updated:

- Changed PCI Express v4.0 to PCI Express v3.0 throughout the document.

957504-M1100G16-DS100; October 10, 2019

Initial release.

957504-M1100G16-DS101; November 5, 2019

Updated:

- Airflow Requirements – Updated the airflow requirement description.

957504-M1100G16-DS100; October 10, 2019

Initial release.

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