MCP1650-H0xxEyy 200Gb/s QSFP56 DAC Product Specifications

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Introduction

NVIDIA® MCP1650-H0xxEyy DAC (Direct Attach Copper) cables are high speed, cost-effective alternatives to fiber optics in 200Gb/s InfiniBand HDR and 200GbE applications.

The QSFP56 passive copper cable[1] contains eight high-speed copper pairs, each operating at data rates of up to 50Gb/s. Each QSFP56 port comprises an EEPROM providing product information, which can be read by the host system.

NVIDIA's unique-quality cable solutions provide power-efficient connectivity for short distance interconnects. It enables higher port bandwidth, density and configurability at a low cost and reduced power requirement in the data centers.

Rigorous cable production testing ensures best out-of-the-box installation experience, performance and durability.

⚠ Images are for illustration purposes only. Product labels, colors, and lengths may vary.

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[1] Raw cables are provided from different sources to ensure supply chain robustness.

Key Features

- IBTA IB HDR and 200GbE compliant
- Up to 200Gb/s data rate
- 4x 50Gb/s PAM4 modulation
- SFF-8665 compliant
- Operating case temperature 0-70°C
- Single 3.3V supply voltage
- Hot pluggable
- RoHS compliant
- LSZH (Low Smoke Zero Halogen) jacket
- LF (Lead Free) HF (Halogen Free) PCB
- SFF-8636 compliant I^2C management interface

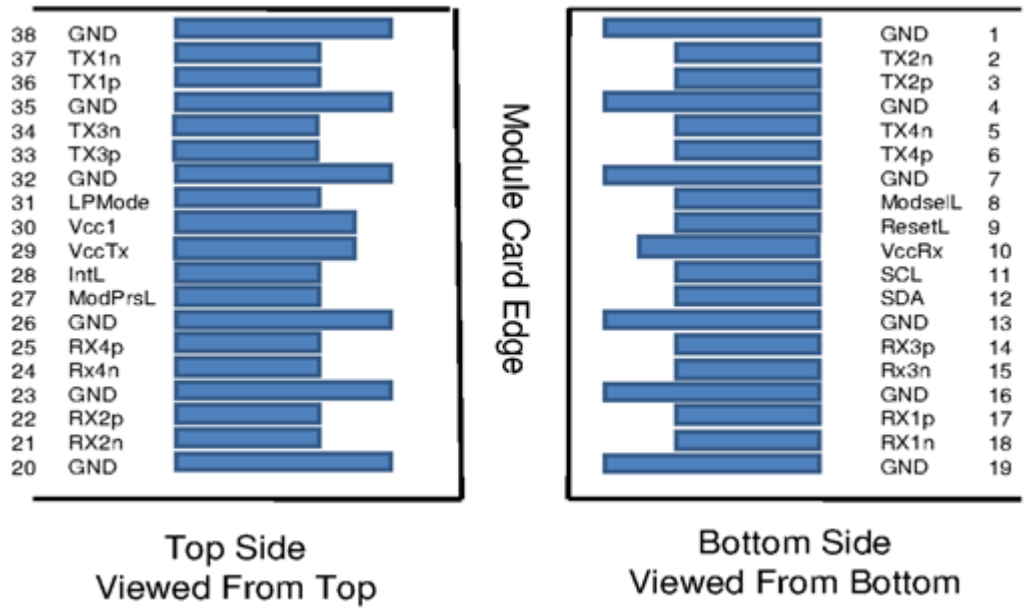
Pin Descriptions

The Direct Attach Copper (DAC) pin assignment is SFF-8679 compliant.

QSFP56 Pin Description

Pin	Symbol	Description	Pin	Symbol	Description
1	GND	Ground	20	GND	Ground
2	Tx2n	Transmitter Inverted Data Input	21	Rx2n	Receiver Inverted Data Output
3	Tx2p	Transmitter Non-Inverted Data Input	22	Rx2p	Receiver Non-Inverted Data Output
4	GND	Ground	23	GND	Grounds
5	Tx4n	Transmitter Inverted Data Input	24	Rx4n	Receiver Inverted Data Output
6	Tx4p	Transmitter Non-Inverted Data Input	25	Rx4p	Receiver Non-Inverted Data Output
7	GND	Ground	26	GND	Ground
8	ModSelL	Module Select	27	ModPrsL	Module Present
9	ResetL	Module Reset	28	IntL	Interrupt
10	Vcc Rx	+3.3V Power Supply Receiver	29	Vcc Tx	+3.3V Power Supply Transmitter
11	SCL	2-wire Serial Interface Clock	30	Vcc1	+3.3V Power Supply
12	SDA	2-wire Serial Interface Data	31	LPMode	Low Power Mode
13	GND	GND	32	GND	Ground
14	Rx3p	Receiver Non-Inverted Data Output	33	Tx3p	Transmitter Non-Inverted Data Input
15	Rx3n	Receiver Inverted Data Output	34	Tx3n	Transmitter Inverted Data Input
16	GND	Ground	35	GND	Ground
17	Rx1p	Receiver Non-Inverted Data Output	36	Tx1p	Transmitter Non-Inverted Data Input
18	Rx1n	Receiver Inverted Data Output	37	Tx1n	Transmitter Inverted Data Input
19	GND	Ground	38	GND	Ground

QSFP56 Module Pad Layout



Top Side
Viewed From Top

Bottom Side
Viewed From Bottom

Specifications

Absolute Maximum Specifications

Absolute maximum ratings are those beyond which the device may be damaged.

Between the operational specifications and absolute maximum ratings, prolonged operation is not intended and permanent device degradation may occur.

Parameter	Min	Max	Units
Supply voltage	-0.3	3.6	V
Data input voltage	-0.3	3.6	V
Control input voltage	-0.3	3.6	V

Environmental Specifications

This table shows the environmental specifications for the product.

Parameter	Min	Max	Units
Storage temperature	-40	85	°C

Operational Specifications

This section shows the range of values for normal operation.

Parameter	Min	Typ	Max	Units
Supply voltage (V_{CC})	3.135	3.3	3.465	V
Power consumption	---	---	0.1	W
Operating case temperature	0		70	°C
Operating relative humidity	5		85	%

Electrical Specifications

Parameter	Min	Typ	Max	Units	Note
Characteristic impedance	90	100	110	Ω	
Time propagation delay	---	---	4.5	ns/m	Informative

EEPROM QSFP56 Memory Map I2C Address A0

Page 00h/ Dec. Byte Address	Register Name	Description
0	Identifier	11h: QSFP28 side of the cable.
1	Status	07h: Support for SFF-8436 Rev. 2.8
128	Identifier	11h: QSFP28
130	Connector	23h: Direct attach assemblies with no separable interfaces
139	Code for Serial Encoding Algorithm	08h: PAM4
146	Length	Length in units of 1 m of direct attach copper cable. According to SFF-8636 section 7.3.12 Length: “For modules with non-separable media interfaces, this field specifies the link length of the cable assembly (copper or AOC) in units of 1 meter. Link length is as specified in the INF-8074 specification. Link lengths less than 1 meter shall indicate 1 meter.”
147	Device technology	A0h: Un-equalized copper cable (passive)
148-163	Vendor name	NVIDIA: ASCII
164	Extended Module Codes for InfiniBand	3Fh: Supports HDR
165-167	QSFP vendor IEEE number	00-02-C9: NVIDIA OUI.
168-183	Part number	MCP1600-XXXXXXX: Part number per backshell label (ASCII)
184-185	Product revision	ZZ: Revision per backshell label (ASCII)
186	Attenuation 2.5GHz	Typical attenuation in 1dB.
187	Attenuation 5GHz	
188	Attenuation 7GHz	
189	Attenuation 12.9GHz	
190	Max case temperature	46h: Support for 70°C
192	Link codes	40h: 50GBASE-CR, 100GBASE-CR2, or 200GBASE-CR4
196-211	Serial number	MTYYWWXXSSSSS: Serial number per backshell label (ASCII). Refer to Backshell Label Legend table below.
212-217	Date code	YYMMDD: Year YY, month MM, day DD.
222	Signaling rate	6Ah: Nominal bit rate per channel, units of 250 MBd.

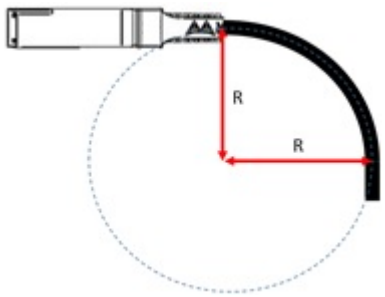
Page 00h/ Dec. Byte Address	Register Name	Description
236	Length 0.1m	Total cable length is the sum of byte 146 for number of meters and byte 236 for 0.1m. Values: 00h: 0m … 09h: 0.9m Examples: 2.5m: Byte 146 = 02h, Byte 236 = 05h 2.25m: Byte 146 = 02h, Byte 236 = 03h
237	AWG	DAC cable AWG information. 18h: AWG=24 19h: AWG=25 1Ah: AWG=26 1Ch: AWG=28 1Eh: AWG=30 20h: AWG=32

Mechanical Specifications

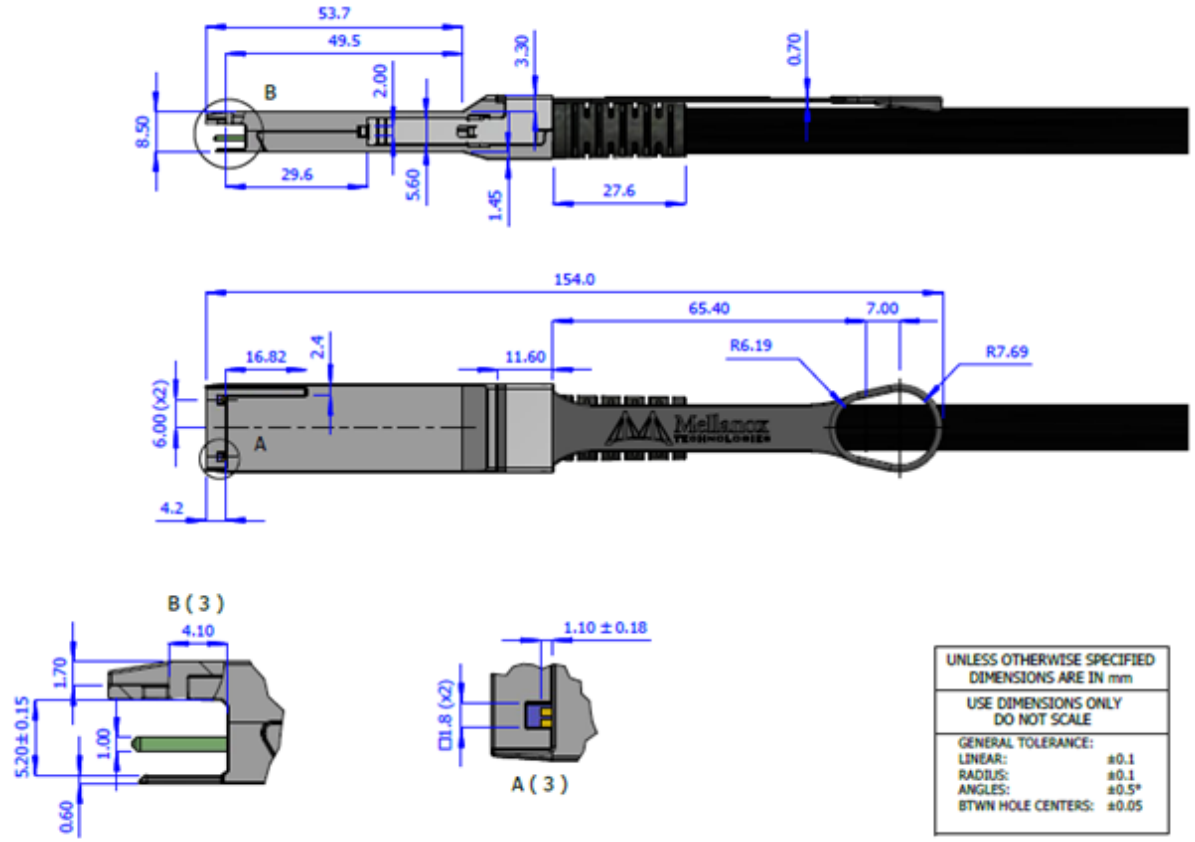
Ordering Part Number	Length (m)	AWG	Single Cable Diameter	Minimum Bend Radius	Cable Color
MCP1650-H00AE30	0.5 ±0.025	30	7.1 ±0.35	Single bend: 35.5mm Assembly/repeated bend: 71mm	Black
MCP1650-H001E30	1 ±0.025				
MCP1650-H01AE30	1.5 ±0.025				
MCP1650-H002E26	2 ±0.050	26	9.4 ±0.4mm	Single bend: 47mm Assembly/repeated bend: 94mm	

The minimum assembly bending radius (close to the connector) is 10x the cable's outer diameter. The repeated bend (far from the connector) is also 10x the cable's outer diameter. The single bend (far from the connector) is 5x the cable's outer diameter.

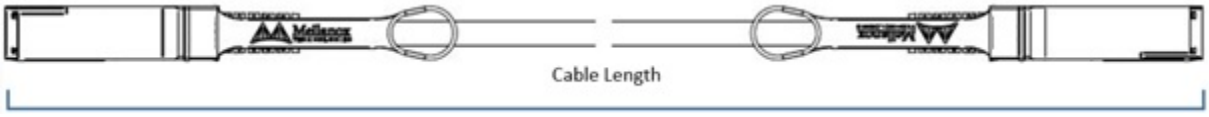
Assembly Bending Radius



Mechanical Dimensions



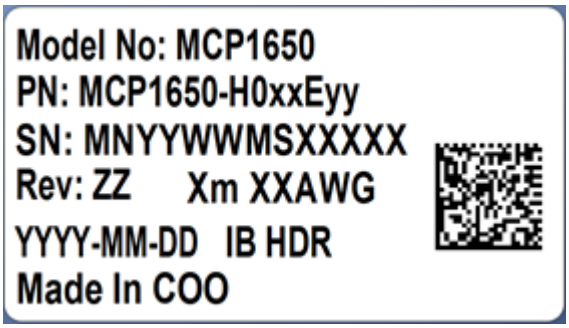
Cable Length Definition



Labels

The following label is applied on the cable's backshell:

Backshell Label



(sample illustration)

Backshell Label Legend

Symbol	Description	Notes
PN – Part Number		
xx	Length	Meter
yy	Cable gauge	American wire gauge
SN – Serial Number		
MN	Manufacturer name	2 characters MT
YY	Year of manufacturing	2 digits
WW	Week of manufacturing	2 digit
MS	Manufacturer site	2 characters
XXXXX	Serial number	5 digits for serial number. Reset at start of week to 00001.
Miscellaneous		
ZZ	HW and SW revision	2 alpha-numeric characters
Xm	Cable length	Meter
XXAWG	Cable gauge	American wire gauge
YYYY-MM-DD	Year-month-day	Year 4 digits, month 2 digits, day 2 digits
COO	Country of origin	E.g. China
	Quick response code	Serial number

The following label is applied on the cable's jacket:

Cable Jacket Label (Middle of Cable)

The following label is applied on the cable's jacket at each end:

(sample illustration)

Note: The serial number and barcode are for NVIDIA internal use only.

Cable Jacket Label Each End (1cm from pulltab end)

(sample illustration)

Regulatory Compliance and Classification

- Safety: CB, UL, CE
- EMC: CE, FCC, ICES, RCM, VCCI

Ask your NVIDIA FAE for a zip file of the certifications for this product.

FCC Class A Notice

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.

Ordering Information

Ordering Part Number	Description
MCP1650-H00AE30	NVIDIA Passive Copper cable, up to 200Gbps, QSFP56 to QSFP56, 0.5m
MCP1650-H001E30	NVIDIA Passive Copper cable, up to 200Gbps, QSFP56 to QSFP56, 1m
MCP1650-H01AE30	NVIDIA Passive Copper cable, up to 200Gbps, QSFP56 to QSFP56, 1.5m
MCP1650-H002E26	NVIDIA Passive Copper cable, up to 200Gbps, QSFP56 to QSFP56, 2m

Please see here for the cable length definition.

Document Revision History

Revision	Date	Description
1.8	Oct. 2023	• Added 200GbE mentions • Updated descriptions in ordering information table
1.7	Nov. 2021	Reformatted and rebranded; migrated to HTML.
1.6	June 2019	Removed 2.5m and 3m OPNs from Table: Cable Mechanical Specifications and Table: Ordering Part Number and Description.
1.5	June 2019	Added note to Length entry of Table: QSFP56 Memory Map I2C Address A0h regarding definition of length in SFF-8636 spec.
1.4	Mar. 4, 2019	Fixed typo in OPN in first paragraph.
1.3	Oct. 4, 2018	Mechanical Specifications – Removed the Mellanox logo from the QSFP56 latch in the figures.
1.2	Aug. 6, 2018	Labels – updated. Table: Cable Mechanical Specifications – updated. Regulatory Compliance and Classification – new.
1.1	May 28, 2018	Table: QSFP56 Memory Map I2C Address A0h– Byte 192 updated.
1.0	Apr. 11, 2018	Initial release.

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