



# **MCP1600-C0xxEyyz 100GbE QSFP28 DAC Cable Product Specifications**

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## Introduction

NVIDIA® MCP1600-C0xxEyyz DAC (Direct Attach Copper) cables are high speed, cost-effective alternatives to fiber optics in 100Gb/s Ethernet applications.

The QSFP28 passive copper cable contains four high-speed copper pairs, each operating at data rates of up to 25GbE. Each QSFP28 port comprises an EEPROM providing product information, which can be read by the host system.

The MCP1600 cables up to 2m support IEEE 802.3bj CA-25G-N (Cable Assembly No-FEC) with low latency. Cables from 3m up to 5m support IEEE 802.3bj CA-25G-L (Cable Assembly Long) with RS-FEC (Reed Solomon Forward Error Correction) enabled<sup>[1]</sup>. For 2.5m and 3m cables, there are two versions supporting either CA-25G-N or CA-25G-L.


NVIDIA 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.

## Key Features

- Up to 100GbE data rate
- SFF-8665 compliant QSFP28
- 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<sup>2</sup>C management interface



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

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

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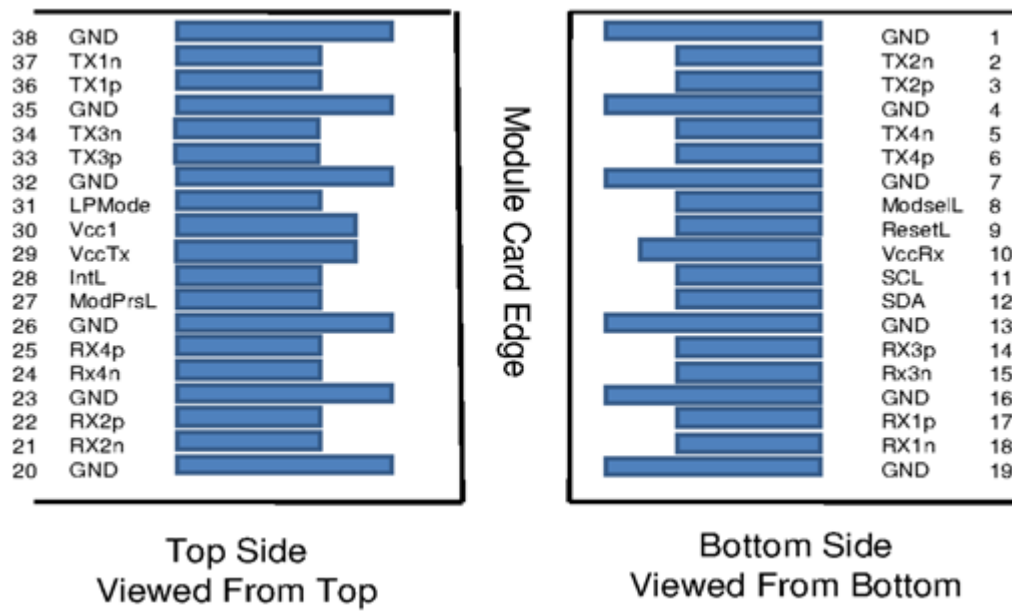
# Pin Description

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

## QSFP28 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

## QSFP28 Module Pad Layout



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# 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	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	Max	Units	Note	
Characteristic impedance	90	100	110	$\Omega$	
Time propagation delay	---	---	4.5	ns/m	Informative

Note: Minimum insertion loss for up to 1m cable length is 6dB @ 12.89GHz.

## EEPROM QSFP28 Memory Map I2C Address A0h

Page 00h/ Dec. Byte Address	Register Name	Description
0	Identifier	11h: QSFP28 side of the cable.
1	Status	06h: Support for SFF-8436 Rev. 2.0
128	Identifier	11h: QSFP28
130	Connector	23h: Direct attach assemblies with no separable interfaces
146	Length	Length in units of 1 m of direct attach copper cable
147	Device technology	A0h: Un-equalized copper cable (passive)
148-163	Vendor name	NVIDIA: ASCII
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	0Bh: CA-L (Cable Assembly FEC) 0Dh: CA-N (Cable Assembly No-FEC)
196-211	Serial number	MTYYWWXXSSSSS: Serial number per backshell label (ASCII). Refer to <a href="#">Back-Shell Label Legend</a> .
212-217	Date code	YYMMDD: Year YY, month MM, day DD.
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

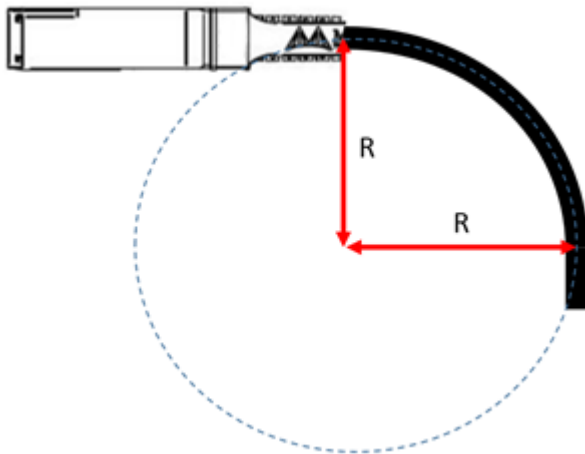


## Mechanical Specifications

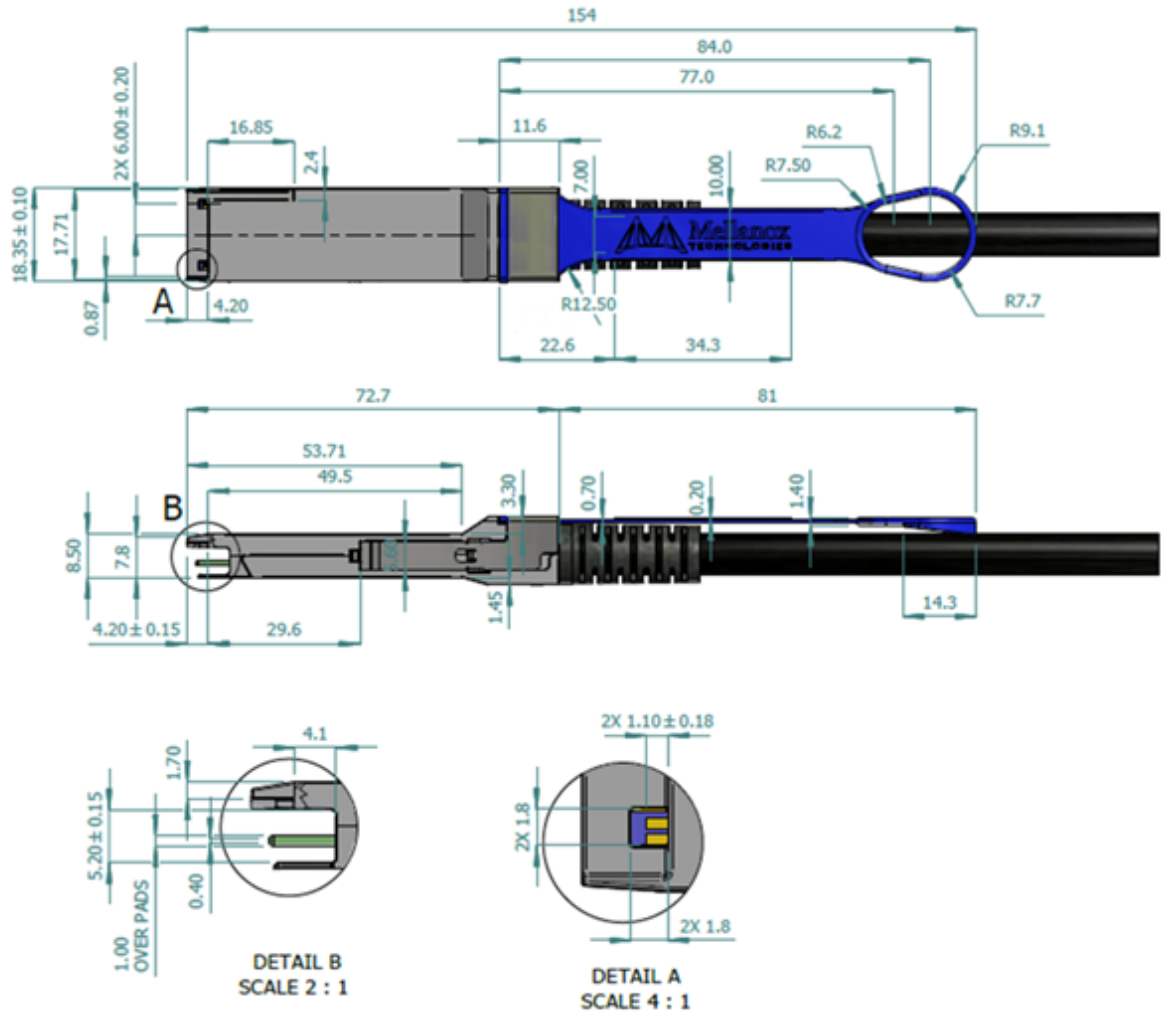
Ordering Part Number	AWG	Single Cable Diameter	Minimum Bend Radius	Length Tolerance	Cable Color
MCP1600-C02AE30L	30	7.1 ±0.35	Single bend: 35.5mm Assembly/Repeated bend: 71mm	+/-25mm	Black
MCP1600-C003E30L					
MCP1600-C00AE30N					
MCP1600-C001E30N					
MCP1600-C01AE30N					
MCP1600-C002E30N					
MCP1600-C005E26L	26	9.4 ±0.4mm	Single bend: 47mm Assembly/Repeated bend: 94mm	+/-50mm	
MCP1600-C02AE26N					
MCP1600-C003E26N					

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.

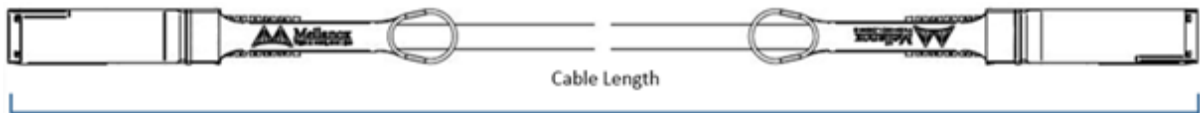
### Assembly Bending Radius



### Mechanical Dimensions

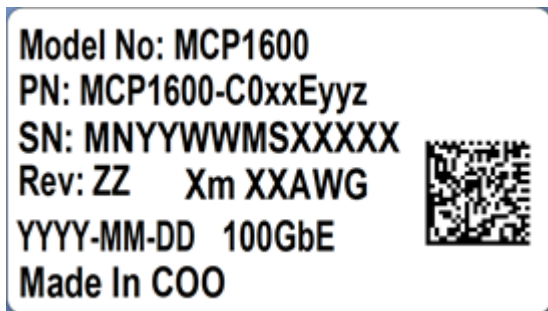


**Cable Length Definition**



**Label Descriptions**

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



(sample illustration)

### Backshell Label Legend

Symbol	Meaning	Notes
xx	Length	Meter
yy	Cable gauge	American wire gauge
z	Link codes	L: CA-L (Cable Assembly FEC) N: CA-N (Cable Assembly No-FEC)
MN	Manufacturer name	2 characters MT (Mellanox Technologies)
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.
ZZ	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 or Malaysia
	Quick response code	Serial number

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



(sample illustration)

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



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

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## Ordering Information

Ordering Part Number	Description
MCP1600-C02AE30L	Passive Copper cable, ETH 100GbE, 100Gb/s, QSFP28, 2.5m, Black, 30AWG, CA-L
MCP1600-C003E30L	Passive Copper cable, ETH 100GbE, 100Gb/s, QSFP28, 3m, Black, 30AWG, CA-L
MCP1600-C005E26L	Passive Copper cable, ETH 100GbE, 100Gb/s, QSFP28, 5m, Black, 26AWG, CA-L
MCP1600-C00AE30N	Passive Copper cable, ETH 100GbE, 100Gb/s, QSFP28, 0.5m, Black, 30AWG, CA-N
MCP1600-C001E30N	Passive Copper cable, ETH 100GbE, 100Gb/s, QSFP28, 1m, Black, 30AWG, CA-N
MCP1600-C01AE30N	Passive Copper cable, ETH 100GbE, 100Gb/s, QSFP28, 1.5m, Black, 30AWG, CA-N
MCP1600-C002E30N	Passive Copper cable, ETH 100GbE, 100Gb/s, QSFP28, 2m, Black, 30AWG, CA-N
MCP1600-C02AE26N	Passive Copper cable, ETH 100GbE, 100Gb/s, QSFP28, 2.5m, Black, 26AWG, CA-N
MCP1600-C003E26N	Passive Copper cable, ETH 100GbE, 100Gb/s, QSFP28, 3m, Black, 26AWG, CA-N

Please see [cable length definition](#).

## Document Revision History

Revision	Date	Description
2.7	Oct. 2021	Reformatted and rebranded; migrated to on-line file. Removed BER bullet.
2.6	Mar. 2021	Updated the Mechanical Drawings
2.5	Jul. 17, 2018	Datasheet renamed to MCP1600-C0xxEyyz_100GbE_QSFP28_DAC_Datasheet. Label Description - Updated.
2.4	Jun. 6, 2018	Key Features - Enables BER... Ordering Information - Removed note about availability.
2.3	Mar. 26, 2018	Table: Cable Mechanical Specifications - Updated values. Table: QSFP28 Memory Map I2C Address A0h - Description of byte 186 updated.
2.2	Mar. 12, 2018	Changed file name to MCP1600-C005E26L_100GbE_QSFP28_DAC_Datasheet Table: Ordering Part Number and Description - Added note about availability.
2.1	Feb. 19, 2018	Introduction - Added text "For 2.5 and 3m cables..." Figure: MCP1600-C0xxEyyz - Updated photo. Table: Electrical Specifications - Added note. Table: QSFP28 Memory Map I2C Address A0h - Byte 1, 186, 236 updated.
2.0	Jan. 3, 2018	New product generation.

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