



## **Specifications**

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## Absolute Maximum Specifications

Absolute maximum ratings are those beyond which damage to the device may occur.

Prolonged operation between the operational specifications and absolute maximum ratings is not intended and may cause permanent device degradation.

Parameter	Symbol	Min	Max	Units
Storage Temperature	$T_S$	-40	85	°C
Operating Case Temperature	$T_{OP}$	0	70	°C
Supply Voltage	$V_{CC}$	-0.5	3.6	V
Relative Humidity (non-condensing)	RH – Option 1	5	95	%
Control Input Voltage	$V_I$	-0.3	$V_{CC}+0.5$	V

### Note

Module temperature per DDMI readout of up to 75°C is allowed.

## Recommended Operating Conditions and Power Supply Requirements

Parameter	Symbol	Min	Typ	Max	Units
Power Supply Voltage	VCC	3.135	3.3	3.465	V
Instantaneous peak current at hot plug (400G)	ICC_IP	-	-	3600	mA
Sustained peak current at hot plug (400G)	ICC_SP	-	-	3000	mA
Maximum Power consumption (400G)	PD	-	8.1	8.5	W

Parameter	Symbol	Min	Typ	Max	Units
Maximum Power consumption, Low Power Mode (400G)	PDLP	-	-	2	W
Instantaneous peak current at hot plug (200G)	ICC_IP	-	-	2200	mA
Sustained peak current at hot plug (200G)	ICC_SP	-	-	1840	mA
Maximum Power consumption (200G)	PD	-	-	5.5	W
Maximum Power consumption, Low Power Mode (200G)	PDLP	-	-	2	W
Signaling Rate per Lane	SRL	-	53.125	-	GBd
Two Wire Serial Interface Clock Rate	-	-	-	400	kHz
Power Supply Noise Tolerance (10Hz - 10MHz)	-	66	-	-	mV
Rx Differential Data Output Load	-	-	100	-	Ohm
Operating distance (OM3)	-	2	-	30	m
Operating distance (OM4)	-	2	-	50	m

## Electrical Specifications

Parameter	Min	Typ	Max	Units
<b>Receiver (Module Input)</b>				
AC common-mode output Voltage (RMS)	-	-	25	mV
Differential output Voltage (Long mode)	-	-	845	mV
Differential output Voltage (Short mode)	-	-	600	mV
Near-end Eye height, differential	70	-	-	mV
Far-end Eye height, differential	30	-	-	mV
Far end pre-cursor ratio	-4.5	-	2.5	%
Differential Termination Mismatch	-	-	10	%
Transition Time (min, 20% to 80%)	9.5	-	-	ps

Parameter	Min	Typ	Max	Units
DC common mode Voltage	-350	-	2850	mV
<b>Transmitter (Module Input)</b>				
Differential pk-pk input Voltage tolerance	750	-	-	mV
Differential termination mismatch	-	-	10	%
Single-ended voltage tolerance range	-0.4	-	3.3	V
DC common mode Voltage	-350	-	2850	mV

Notes:

Amplitude customization beyond these specs is dependent on validation in customer system.

## Electrical Specification for Low Speed Signal

Parameter	Symbol	Min	Max	Units
Module output SCL and SDA	VOL	0	0.4	V
	VOH	VCC-0.5	VCC+0.3	V
Module Input SCL and SDA	VIL	-0.3	VCC*0.3	V
	VIH	VCC*0.7	VCC+0.5	V

## Optical Specifications

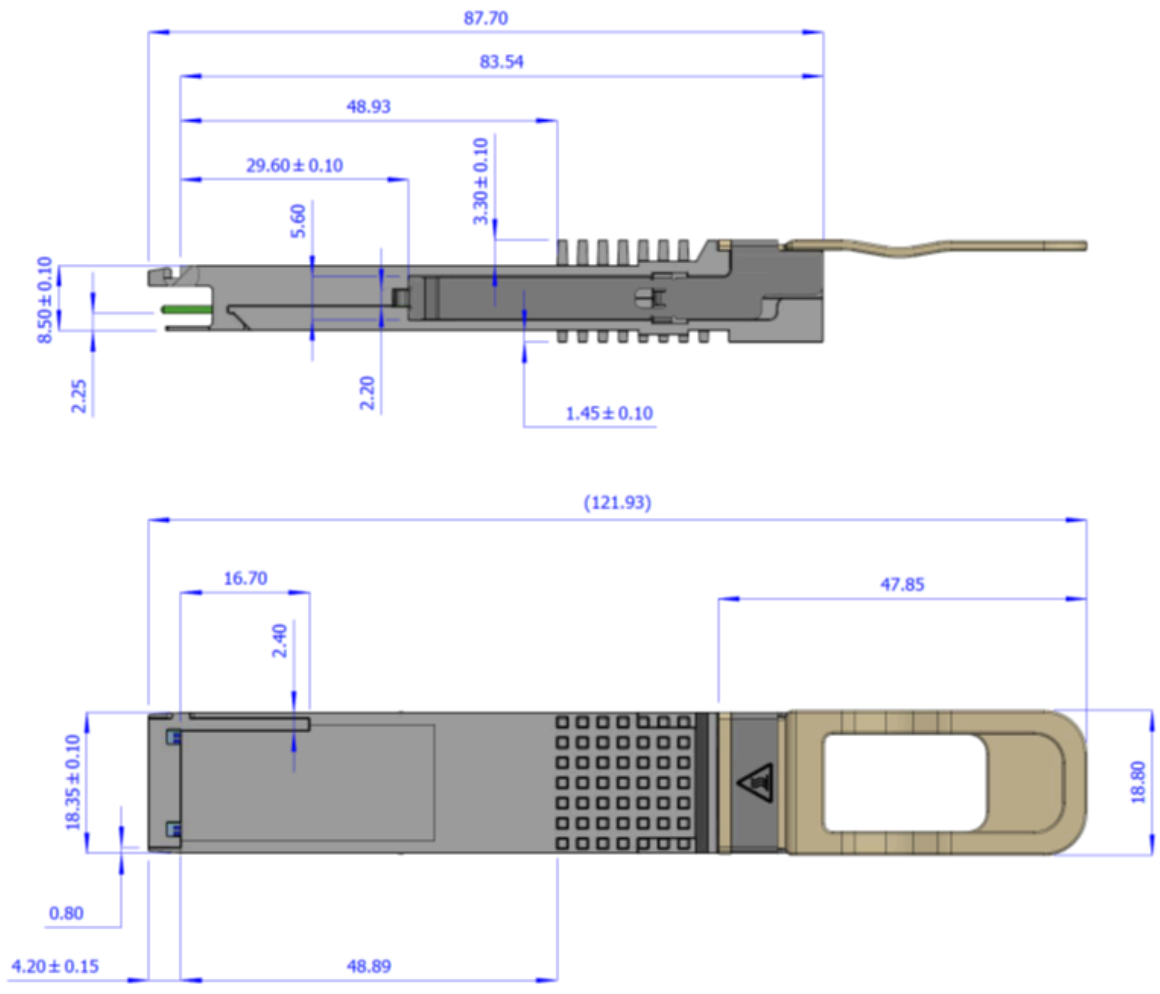
Parameter	Symbol	Min	Typ	Max	Unit	Notes
<b>Transmitter</b>						
Wavelength	$\lambda_C$	844	850	863	nm	
RMS spectral width	$\Delta\lambda$			0.6		

Average Launch Power, each lane	AOPL	-4.6	-	4.0	dBm	1
Outer Optical Modulation Amplitude (OMA <sub>outer</sub> ), each lane (min)	TOMA	-2.6		3.5	dBm	2
Transmitter and Dispersion Eye Closure for PAM4 (TDECQ), each lane	TDECQ	-	-	4.4	dB	
Average Launch Power of OFF Transmitter, each lane	TOFF	-	-	-30	dBm	
Extinction Ratio, each lane	ER	-	<u>2.5</u>		dB	
RIN <sub>21.4OMA</sub>	RIN	-	-	-132	dB/Hz	
Optical Return Loss Tolerance	ORL	-	-	12	dB	
Transmitter Reflectance	TR	-	-	-26	dB	3
<b>Receiver</b>						
Wavelength	$\lambda_C$	842	850	863	nm	
Damage Threshold, average optical power, each lane	AOPD	5	-	-	dBm	
Average Receive Power, each lane	AOPR	-6.3	-	4.0	dBm	6
Receive Power (OMA <sub>outer</sub> ), each lane	OMA-R	-	-	3.5	dBm	
Receiver Reflectance	RR	-	-	-26	dB	
Receiver Sensitivity (OMA <sub>outer</sub> ), each lane	SOMA	-	-	-4.4	dBm	4
Stressed Receiver Sensitivity (OMA <sub>outer</sub> ), each lane	SRS	-	-	-1.8	dBm	5
Conditions of stressed receiver sensitivity test						
Stressed eye closure for PAM4	SECQ	4.4		dB		
OMA <sub>outer</sub> of each aggressor lane	OMA <sub>outer</sub>	3.5		dBm		

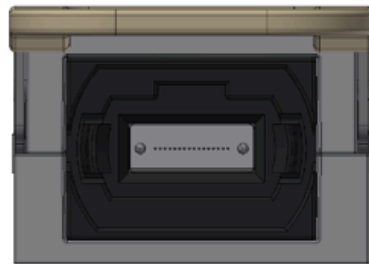
Notes:

1. Average launch power, each lane (min) is informative and not the principal indicator of signal strength.
2. Even if  $\max(\text{TECQ}, \text{TDECQ}) < 1.8\text{dB}$ ,  $\text{OMA}_{\text{outer}}$  (min) must exceed this value.
3. Transmitter reflectance is defined looking into the transmitter.
4. Receiver sensitivity ( $\text{OMA}_{\text{outer}}$ ), each lane (max) is informative and is defined for a transmitter with SECQ of 0.9 dB.
5. Measured with conformance test signal at TP3 for the  $\text{BER} = 2.4 \times 10^{-4}$
6. Minimum power is informative. AOP above the minimum does not ensure compliance

## Mechanical Specifications

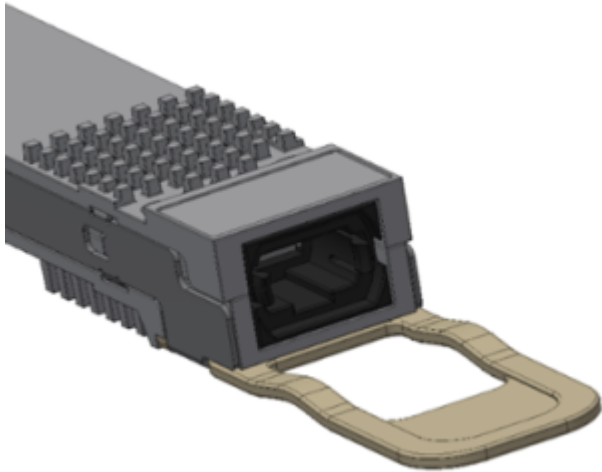


Connector illustration



This is the 'head end'. The connectors in the fiber cable splitter 'tails' have same layout but only 2 transmit and 2 receive fibers with the middle 8 positions empty.





Module port labeling and lane routing. Txn/Rxn refers to the OSFP pin description

Single mode optics are denoted by a yellow-colored pull tab and yellow-colored optical fiber. The green plastic shell on the MPO-12/APC optical connector denotes Angled Polish Connector.

### **(i) Note**

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

## **Labels**

### **Back shell Label**

The label applied on the transceiver's back-shell is illustrated below. Note that the Images are for illustration purposes only. Labels look and placement may vary.

Transceiver Label (Illustration)



**(i) Note**

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

**Transceiver Back-Shell Label Serial Number Legend**

Symb ol	Meaning	Notes
MT	Manufacturer name	2 digits (alphanumeric)
YY	Year of manufacturing	2 last digits of the year (numeric)
WW	Week of manufacturing	2 digits (numeric)
JC <i>or</i>	Manufacturer Site: JC - Option 1 (China)	Two characters

DM	DM – Option 2 (Malaysia)	
SSSSS	Serial number	5 digits (decimal numeric) for serial number, starting from 00001.

## Regulatory Compliance

The transceiver is a Class 1M laser product. It is certified per the following standards:

Feature	Agency	Standard
Laser Eye Safety	FDA/CDRH	CDRH 21 CFR 1040 and Laser Notice 50
Electrical Safety	CB	IEC 62368
Electrical Safety	UL/CSA	UL 62368 and CAN/CSAN 62368



### **Warning**

Warning: Exposure to the laser light can cause damage to the eyes. Use protective face gear while handling this product and keep the laser light away from the eyes and face.

## Connector and Cabling Details

## MPO-12/APC Optical Connector

The Twin-port transceiver has a unique NVIDIA patented design enabling two, multiple-push-on/angled-polished-connector 12-fiber (MPO-12/APC) optical connectors per single OSFP form-factor by turning the optical connectors vertically in the twin-port transceiver end. This enables it to host two transceivers inside, each with its own MPO-12/APC optical connector operating independently that can link to another Twin-port transceiver or to a single-port 400Gb/E transceiver.

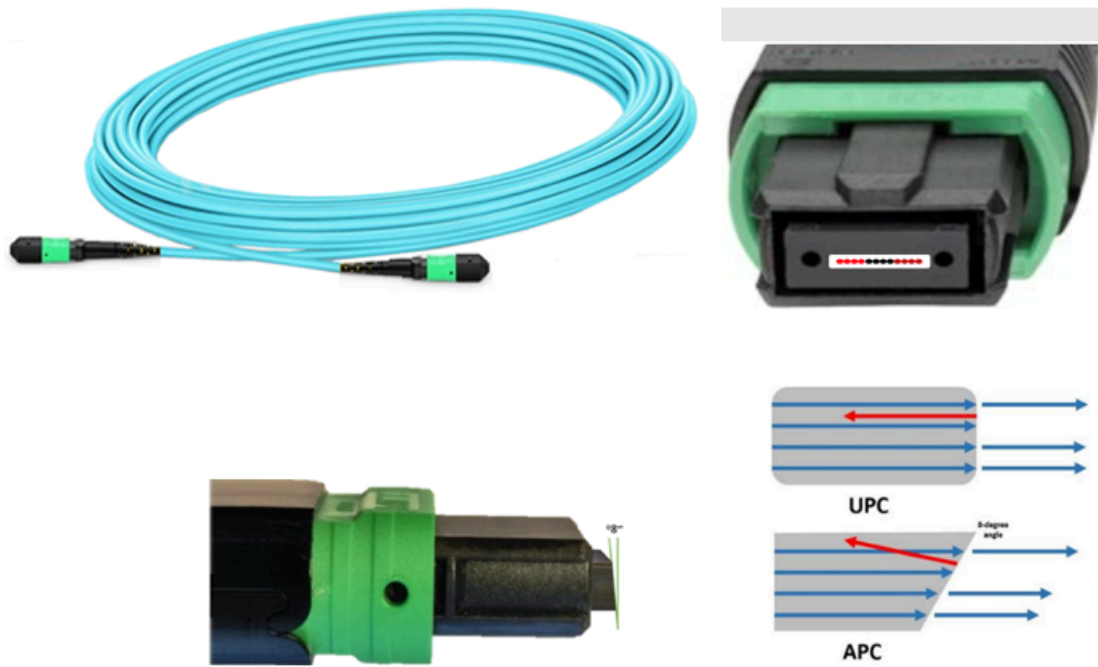
The MPO-12 has a 12-fiber ribbon but only 8-fibers are used – four transmit and four receive fibers for the 4-channels of 100G-PAM4.

- The APC design minimizes back reflections and signal interference by diverting back reflected light from the fiber face to be absorbed into the fiber cladding.
- A positioning key on top of the connector together with the alignment pins define the fiber position numbering scheme to align pin 1 in the optical connector to pin 1 in the transceiver also called “polarity”
- Transceivers have alignment pins for precise positioning of the cable connector against the optical beams. The fiber cable has alignment holes matching the transceiver’s pins.
- It is important to note that transceivers have pins. Optical connectors have holes and are used with transceivers. Optical connectors with pins are not compatible with transceivers and are used in trunk cabling to connect two fiber cables together.

The MPO-12/APC optical connector is used in both the single mode and multimode fiber cables.

Multimode optics is denoted by a tan-colored pull tab and aqua-colored optical fiber. Green plastic shell on the MPO-12/APC connector denotes Angled Polish Connector and is not compatible with aqua colored shell for Ultra-flat Polished Connectors (UPC) for HDR.

### **MPO-12/APC Showing 4-Transmit and 4-Receive Fibers and Angled Polish Connector End**



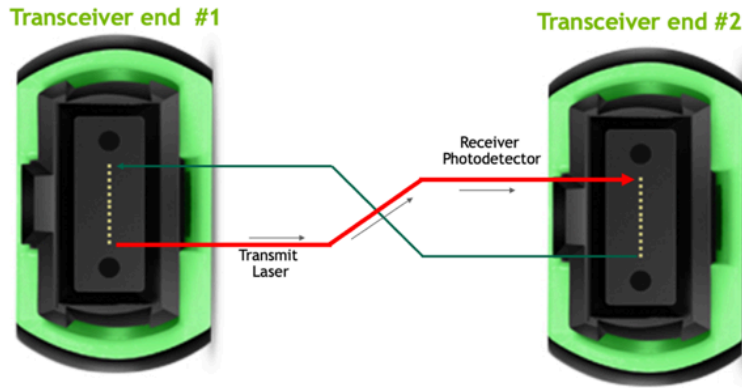
## NVIDIA Supplied Crossover Type-B Fiber Cables

Linking two transceivers directly together requires aligning the transceiver laser sources with the correct photo detectors in the receive transceiver. Transmit and receive fibers are switched inside the cable enabling two transceivers to be directly connected to each other. This is called a Type-B crossover fiber.

Each of the two 4-channel ports in the Twin-port transceiver has its own 4-channel optical connector that can link to two single-port 400Gb transceiver. Two fiber cables are needed for each Twin-port transceiver.

Fiber cables are crossover cable Type-B that aligns the transmit laser with the opposite transceiver's receiver photodetector allowing to directly connect two transceivers together to maintain minimum optical losses, lowest back reflections, longest reach and increased reliability without the use of optical patch panels. For Twin-port transceivers, both cables must be the same type (straight or 1:2 splitter) although different lengths are allowed.

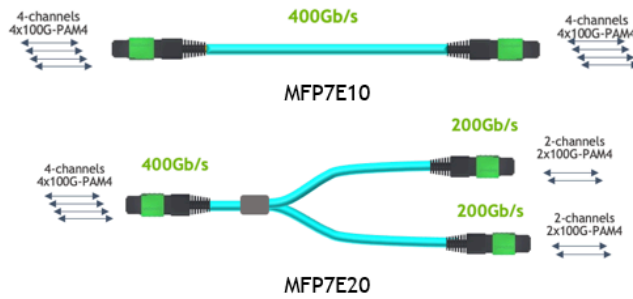
### Crossover Cable Design



### Multimode Straight and Splitter Cables

Twin-port transceiver side

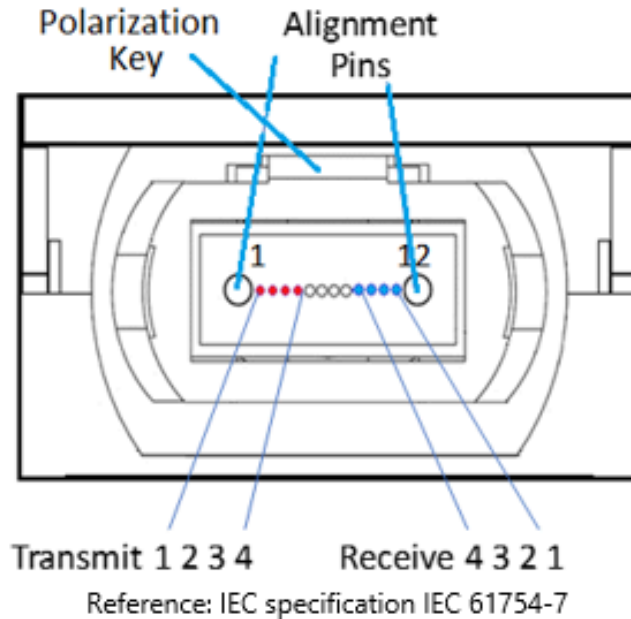
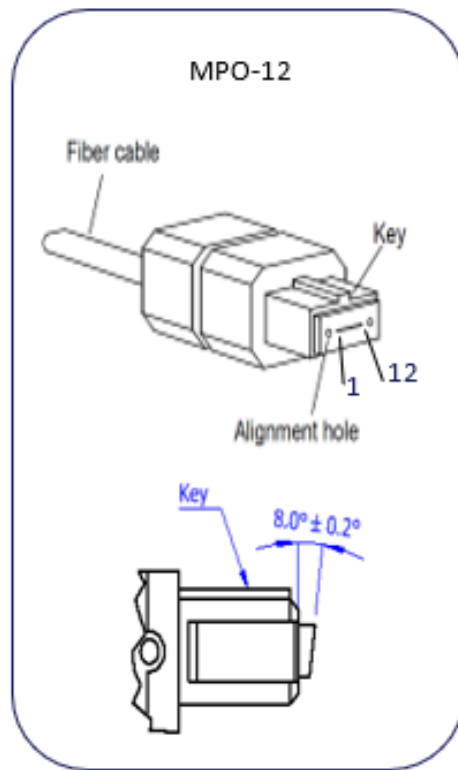
HCA DPU side



**Note: Refer to the Recommended Fiber Cables table for more information.**

Transceivers have alignment pins for precise positioning of the cable connector against the optical beams. The fiber cable has alignment holes matching the transceiver's pins.

## MPO Connector with Alignment Holes and Positioning Key



NDR transceiver: MPO Receptacle, Lane Assignment, and Positioning Key (front view)

## Handling and Cleaning

The transceiver can be damaged by exposure to current surges and over voltage events. Take care to restrict exposure to the conditions defined in Absolute Maximum Ratings. Observe normal handling precautions for electrostatic discharge-sensitive devices.

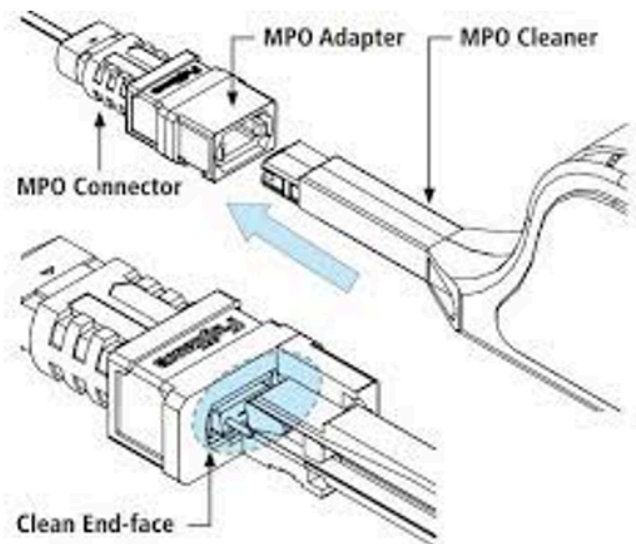
The transceiver is shipped with dust caps on both the electrical and the optical port. The cap on the optical port should always be in place when there is no fiber cable connected. The optical connector has a recessed connector surface which is exposed whenever it has no cable nor cap.

Important note 1: Keep both the fiber and transceiver dust caps.

Important note 2: Clean both transceiver receptacle and cable connector prior to insertion of the fiber cable, to prevent contamination from it.

The dust cap ensures that the optics remain clean during transportation. Standard cleaning tools and methods should be used during installation and service. Liquids must not be applied.

Important note 3: 80% of transceiver link problems are related to dirty optical connectors.



## Cable Management Guidelines

For more information and general interconnect management and installation, see [NVIDIA Cable Management Guidelines](#) and [FAQ Application Note](#).