Features

- OSFP form factor hot pluggable
- CMIS compliance
- 4 parallel lanes of 100G-PAM4 electrical and optical parallel lanes
- optical port of MPO-12/APC
- Up to 50m reach on multi-mode fiber OM4 and 30m on OM3 with FEC
- Operating case temperature: 0~70°C
- 9 Watts max
- RoHS compliant

Applications

- 1x400G VR4, 1 of 400G per port to point connections.
- 4x100G VR, 4 of 100G per channel breakout connections

Description

This product is a 400Gb/s Octal Small Form-factor Pluggable (OSFP) optical module without top open fin designed for 50m with OM4 fiber optical communication applications. The module converts 4 channels of 100Gb/s (PAM4) electrical input data to 4 channels of parallel optical signals, each capable of 100Gb/s operation for an aggregate data rate of 400Gb/s. Reversely, on the receiver side, the module converts 4 channels of parallel optical signals of 100Gb/s each channel for an aggregate data rate of 400Gb/s into 4 channels of 100Gb/s (PAM4) electrical output data.

MPO-12 connector can be plugged into the OSFP112 VR4 module jack with 4 channels. Proper alignment is ensured by the guide pins inside the receptacle. The cable usually cannot be twisted for proper channel to channel alignment. Electrical connection is achieved through an QSFP MSA-compliant edge type connector.

Absolute Maximum Ratings

Parameter	Symbol	Min.	Typ.	Max.	Units	Note
Storage Temperature	*Ts*	-40		85	°C	
Operating Case Temperature	T_{op}	0		70	°C	
Power Supply Voltage	V_{cc}	-0.5		3.6	V	
Relative Humidity (non-condensation)	*RH*	0		85	%	

Recommended Operating Conditions

Parameter	Symbol	Min.	Typ.	Max.	Units	Note
Operating Case Temperature	T_{op}	0		70	°C	
Power Supply Voltage	V_{cc}	3.135	3.3	3.465	V	
Data Rate, each Lane			53.125		Gb/s	PAM4
Data Rate Accuracy		-100		100	ppm	
Pre-FEC Bit Error Ratio				$2.4x10^{-4}$		
Post-FEC Bit Error Ratio				$1x10^{-12}$		1
Link Distance (OM4)	*D*	2		50	m	2
Link Distance (OM3)	*D*	2		30	m	2

Notes:

1. FEC provided by host system.
2. FEC required on host system to support maximum distance.

Diagnostics Monitoring

Parameter	Symbol	Accuracy	Unit	Notes
Temperature monitor absolute error	DMI_Temp	± 3	°C	Over operating Temp
Supply voltage monitor absolute error	DMI_VCC	± 0.1	V	Full operating range
RX power monitor absolute error	DMI_RX	± 2 dB	dB	1
Bias Current monitor	DMI_Ibias	± 10%	mA	
Laser power monitor absolute error	DMI_TX	± 2 dB	dB	1

Notes:

1. Due to measurement accuracy of different single mode fibers, there could be an additional +/-1 dB fluctuation, or a +/- 3 dB total accuracy.

Optical Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Units	Note
Transmitter						
Date Rate, each Lane			53.125 ± 100 ppm		Gb/s	
Modulation Format			PAM4			
Center Wavelength	λ	842		948	nm	
RMS Spectral Width				0.65	nm	1
Average Launch Power, each Lane	P_{AVG}	-4.6		4	dBm	
Outer Optical Modulation Amplitude (OMA_{outer}), each Lane	P_{OMA}	-2.6 (for max TECQ, TDECQ≦ 1.8dB) - 4.4+max(TECQ,TDECQ)(for 1.8<max(TECQ,TDECQ)≦4.4dB		3.5	dBm	
Transmitter and Dispersion Eye Closure for PAM4(TDECQ), each Lane	*TDECQ*			4.4	dB	
Transmitter Eye Closure for PAM4, each Lane	*TECQ*			4.4	dB	
Overshoot/Undershoot				29	%	
Transmitter Power Excursion, each Lane				2.3	dBm	
Extinction Ration	*ER*	2.5			dB	
RIN_{14} OMA	*RIN*			-132	dB/Hz	
Optical Return Loss Tolerance	*TOL*			14	dB	
Transition Time	*Tt*			17	ps	
Average Launch Power of OFF Transmitter, each Lane	P_{off}			-30	dBm	

Encircled Flux			≧86% at 19 μm ≦30% at 4.5 μm		2
Receiver					
Data Rate, each Lane			53.125 ± 100 ppm	Gb/s	
Modulation Format			PAM4		
Damage Threshold, each Lane	TH_4	5		dBm	3
Average Receiver Power, each Lane		-6.3	4	dBm	4
Receiver Power (OMA_{outer}), each Lane			3.5	dBm	
Receiver sensitivity (OMA_{outer}), each lane	*SEN*		-4.4(for TECQ≦1.8dB) - 6.2+TECQ (for 1.8<TECQ≦4.4dB)	dBm	5
Stressed Receiver Sensitivity (OMA_{outer}), each Lane	*SRS*		-1.8	dBm	6
Receiver Reflectance	R_R		-15	dB	
LOS Assert	*LOSA*	-15		dBm	
LOS De-assert	*LOSD*		-9.2	dBm	
LOS Hysteresis	*LOSH*	0.5		dB	
Stressed Conditions for Stress Receiver Sensitivity (Note 7)					
Stressed Eye Closure for PAM4 (SECQ), Lane under Test			4.4	dB	
OMA_{outer} of each Aggressor Lane			3.5	dBm	

Notes:

1. RMS spectral width is the standard deviation of the spectrum.
2. If measured into type A1a.2 or type A1a.3 or A1a.4, 50 μm fiber, in accordance with IEC 61280-1-4.
3. The receiver shall be able to tolerate, without damage, continuous exposure to an optical input signal having this power level on the lane. The receiver does not have to operate correctly at this input power.
4. Average receiver power, each lane (min) is informative and not the principal indicator of signal strength. A received

power below this value cannot be compliant, however, a value above this does not ensure compliance.

5. Receive sensitivity (OMA_{outer}), is informative and is defined for a transmitter with a value of TECQ up to 4.4dB.

Receiver sensitivity should meet Equatio (1), which is illustrated in Figure 5.

RS = max (-4.4, TECQ-6.2) dBm (1)

Where:

RS is the receiver sensitivity, and

TECQ is the TECQ of the transmitter used to measure the receiver sensitivity.

6. Measured with conformance test signal for BER=$2.4x10^{-4}$

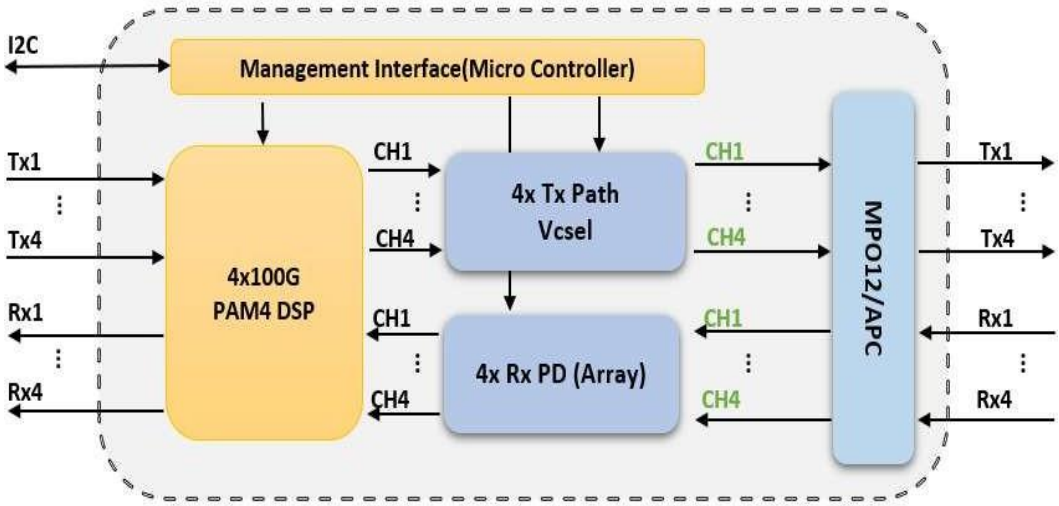
7. These test conditions are for measuring stressed receiver sensitivity. They are not characteristics of the receiver.

Electronical Characteristics

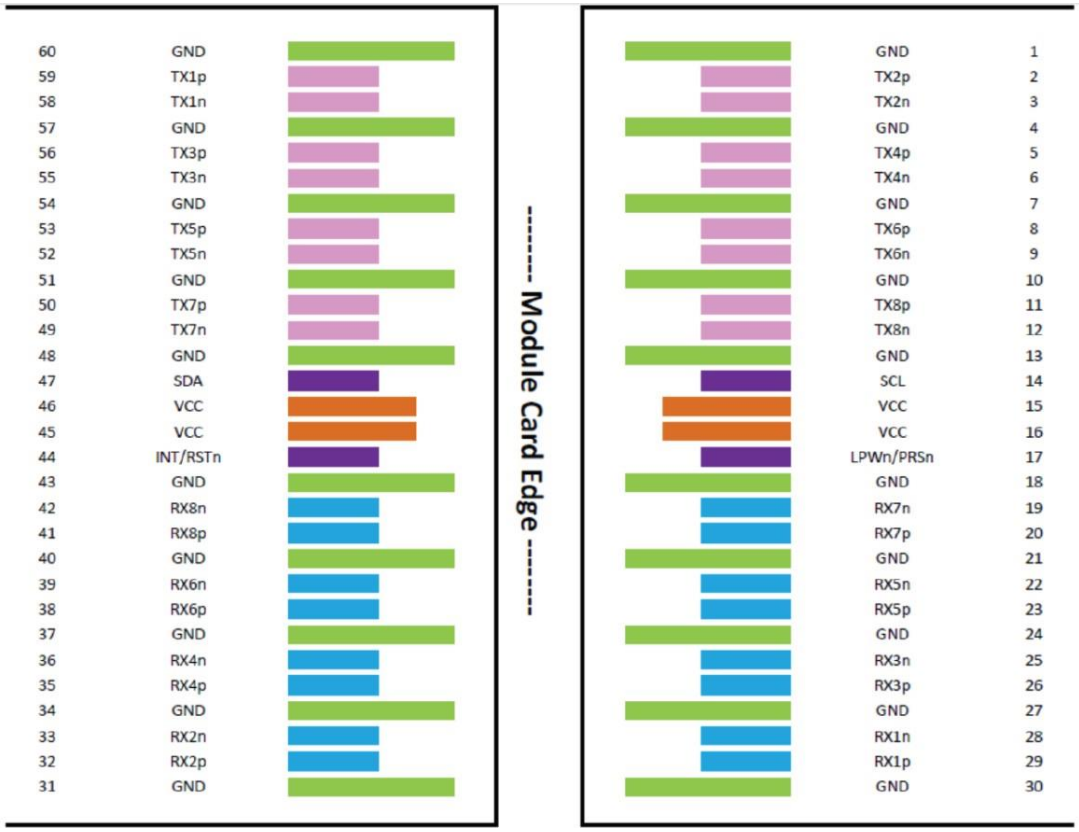
Parameter	Symbol	Min.	Typ.	Max.	Units	Note
Power Consumption				9	W	
Supply Current	*Icc*			2.87	A	
Transmitter (each Lane)						
Signaling Rate, each Lane	*TP1*		53.125 ± 100 ppm		Gb/s	
Differential pk-pk Input Voltage Tolerance	*TP1a*	750			mV	
Peak-to-peak AC Common-Mode Voltage Tolerance Low-Frequency, VCM_{LF} Full-Band, VCM_{FB}	*TP1a*	32 80			mV	
Differential-Mode to Common-Mode Return Loss, RLcd	*TP1*	IEEE 802.3ck Equation (120G-2)			dB	
Effective Return Loss, ERL	*TP1*	8.5			dB	
Differential Termination Mismatch	*TP1*			10	%	
Module Stressed Input Test	*TP1a*		See IEEE 802.3ck 120G.3.4.3			
Single-ended Voltage Tolerance Range	*TP1a*	-0.4 to 3.3			V	
DC Common Mode Tolerance Upper Limit Lower Limit	*TP1*		 2.85 -0.35		 V	
Receiver (each Lane)						
Signaling Rate, each lane	*TP4*		53.125 ± 100 ppm		Gb/s	
Peak-to-Peak AC Common-Mode Voltage Low-Frequency, VCM_{LF} Full-Band, VCM_{FB}	*TP4*			32 80	mV	
Differential Peak-to-Peak Output Voltage Short Mode	*TP4*			600 845	mV	

Long Mode					
Eye Height	*TP4*	15			mV
Vertical Eye Closure, VEC	*TP4*			12	dB
Common to Differential Mode Return Loss, RLdc	*TP4*	IEEE 802.3-ck Equation (120G-1)			dB
Effective Return Loss, ERL	*TP4*	8.5			dB
Differential Termination Mismatch	*TP4*			10	%
Transition Time	*TP4*	8.5			ps
DC Common -Mode Voltage Tolerance					
Upper Limit	*TP4*		2.85		V
Lower Limit			-0.35		

Transceiver Block Diagram



Pin Assignment and Description



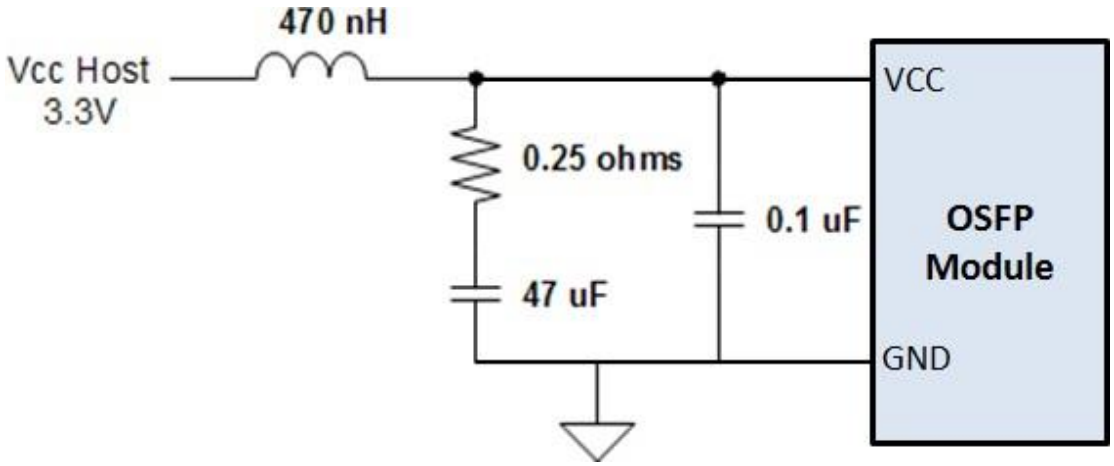
Pin Descriptions

Pin	Symbol	Description	Logic	Description	Note
1	GND		Ground		1
2	TX2p	Transmitter Data Non-Inverted	CML-I	Input from Host	3
3	TX2n	Transmitter Data Inverted	CML-I	Input from Hos	3
4	GND		Ground		1
5	TX4p	Transmitter Data Non-Inverted	CML-I	Input from Host	3
6	TX4n	Transmitter Data Inverted	CML-I	Input from Hos	3
7	GND		Ground		1
8	TX6p	Transmitter Data Non-Inverted	CML-I	Input from Host	3
9	TX6n	Transmitter Data Inverted	CML-I	Input from Hos	3
10	GND		Ground		1
11	TX8p	Transmitter Data Non-Inverted	CML-I	Input from Host	3
12	TX8n	Transmitter Data Inverted	CML-I	Input from Hos	3
13	GND		Ground		1
14	SCL	2-wire Serial interface clock	LVCMOS-I/O	Bi-directional	3
15	VCC	+3.3V Power		Power from Host	2
16	VCC	+3.3V Power		Power from Host	2
17	LPWn/PRSn	Low-Power Mode / Module Present		Bi-directional	3
18	GND		Ground		1
19	RX7n	Receiver Data Inverted	CML-O	Output to Host	3
20	RX7p	Receiver Data Non-Inverted	CML-O	Output to Host	3
21	GND		Ground		1
22	RX5n	Receiver Data Inverted	CML-O	Output to Host	3
23	RX5p	Receiver Data Non-Inverted	CML-O	Output to Host	3
24	GND		Ground		1
25	RX3n	Receiver Data Inverted	CML-O	Output to Host	3
26	RX3p	Receiver Data Non-Inverted	CML-O	Output to Host	3
27	GND		Ground		1
28	RX1n	Receiver Data Inverted	CML-O	Output to Host	3

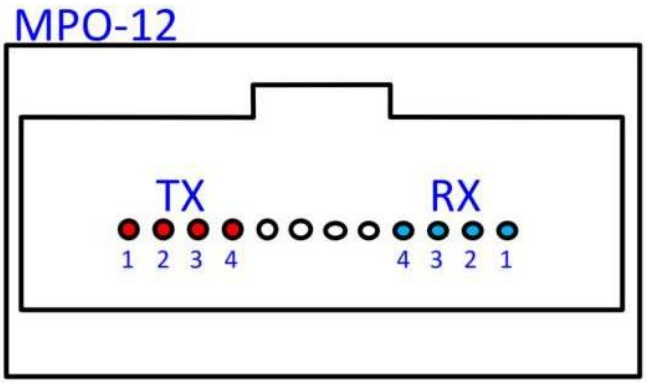
29	RX1p	Receiver Data Non-Inverted	CML-O	Output to Host	3
30	GND		Ground		1
31	GND		Ground		1
32	RX2p	Receiver Data Non-Inverted	CML-O	Output to Host	3
33	RX2n	Receiver Data Inverted	CML-O	Output to Host	3
34	GND		Ground		1
35	RX4p	Receiver Data Non-Inverted	CML-O	Output to Host	3
36	RX4n	Receiver Data Inverted	CML-O	Output to Host	3
37	GND		Ground		1
38	RX6p	Receiver Data Non-Inverted	CML-O	Output to Host	3
39	RX6n	Receiver Data Inverted	CML-O	Output to Host	3
40	GND		Ground		1
41	RX8p	Receiver Data Non-Inverted	CML-O	Output to Host	3
42	RX8n	Receiver Data Inverted	CML-O	Output to Host	3
43	GND		Ground		1
44	INT/RSTn	Module Interrupt / Module Reset	Multi-Level	Bi-directional	3
45	VCC	+3.3V Power		Power from Host	2
46	VCC	+3.3V Power		Power from Host	2
47	SDA	2-wire Serial interface data	LVCMOS I/O	Bi-directional	3
48	GND		Ground		1
49	TX7n	Transmitter Data Inverted	CML-I	Input from Host	3
50	TX7p	Transmitter Data Non-Inverted	CML-I	Input from Host	3
51	GND		Ground		
52	TX5n	Transmitter Data Inverted	CML-I	Input from Host	3
53	TX5p	Transmitter Data Non-Inverted	CML-I	Input from Host	3
54	GND		Ground		
55	TX3n	Transmitter Data Inverted	CML-I	Input from Host	3
56	TX3p	Transmitter Data Non-Inverted	CML-I	Input from Host	3
57	GND		Ground		
58	TX1n	Transmitter Data Inverted	CML-I	Input from Host	3
59	TX1p	Transmitter Data Non-Inverted	CML-I	Input from Host	3

60	GND		Ground		1

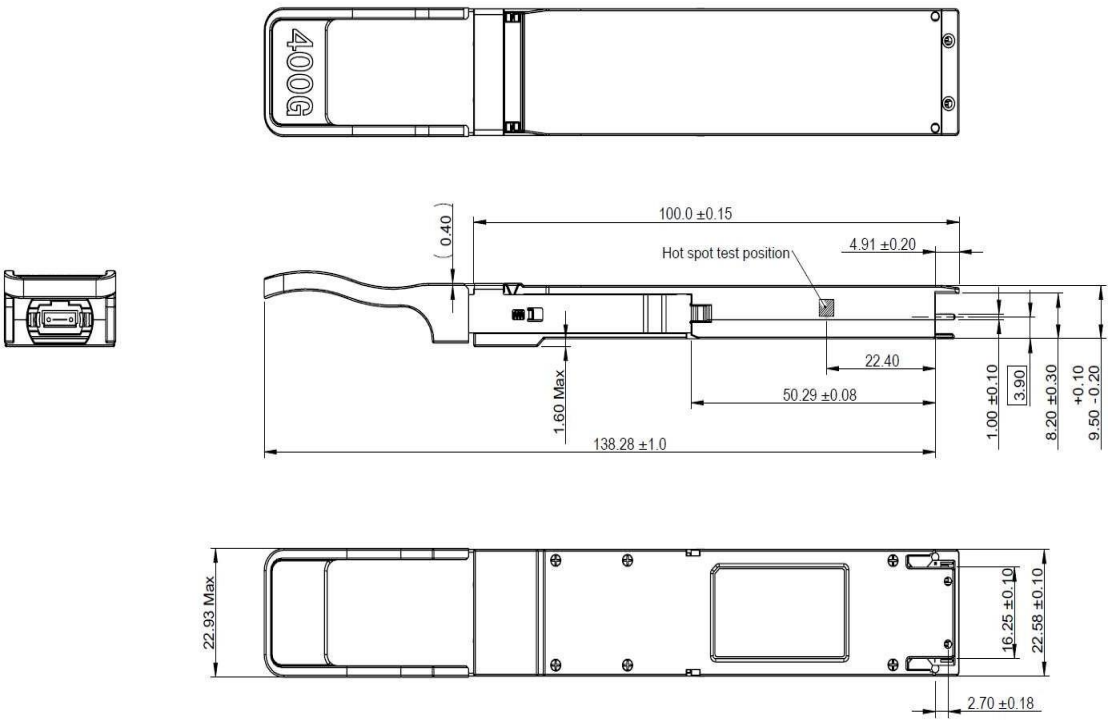
Recommended Power Supply Filter



Optical Port Description



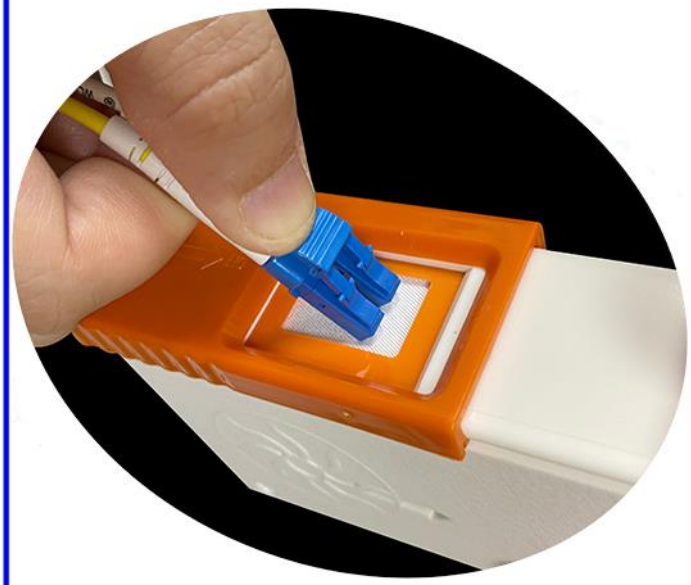
Dimensions


400G
100.0 ±0.15
0.40
Hot spot test position
4.91 ±0.20
22.40
50.29 ±0.08
1.60 Max
138.28 ±1.0
1.00 ±0.10
3.90
8.20 ±0.30
9.50 +0.10 -0.20
22.93 Max
16.25 ±0.10
22.58 ±0.10
2.70 ±0.18

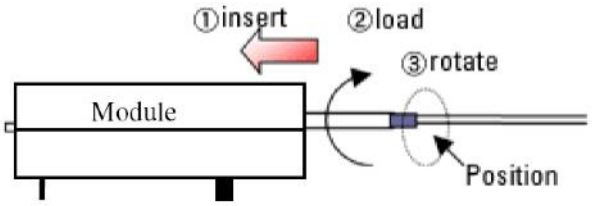
Optical Receptacle Cleaning Recommendations :

All fiber stubs inside the receptacle portions were cleaned before shipment. In the event of contamination of the optical ports, the recommended cleaning process is the use of forced nitrogen. If contamination is thought to have remained, the optical ports can be cleaned using a NTT international Cletop® stick type and HFE7100 cleaning fluid. Before the mating of patch-cord, the fiber end should be cleaned up by using Cletop® cleaning cassette.

Cleaning of patch-cord



Cleaning of fiber stub



1. Insert
   Ensure that stick is held straight when inserting into sleeve.
2. Load
   Apply sufficient pressure (approx 600-700g) to ensure ferrule a little depressed in sleeve.
3. Rotate
   Rotate stick clockwise 4-5 times, while ensuring direct contact with ferrule end-face is maintained.

Notice: Number of possible wipes:
Maintenance (repair) ~1 use / piece
Equipment construction: 4 uses / piece (max.)

Note: The pictures were extracted from NTT-ME website. And the Cletop® is a trademark registered by NTT-ME

Ordering Information

Model Number	Part Number	Voltage	Temperature
400G OSFP112 VR4	OPOY-MT5-85-CB	3.3V	0°C to 70 °C

Modification History

Revision	Date	Description
A1	Jun. 2023	Initial Release

Note: All information contained in this document is subject to change without notice.