



Features

- Hot pluggable CFP4 MSA form factor
- Supports 103.1Gb/s to 112.2Gb/s aggregate bit rates
- Compliant to IEEE 802.3bm 100GBASE-SR4
- Power class 2 (<2.5W max)
- Up to 70m on OM3 and 100m OM4 MMF transmission
- Up to 28Gb/s data rate per channel
- Operating case temperature: 0°C ~70°C
- 4x28G Electrical Serial Interface (CEI-28G-VSR)
- MDIO management interface with digital diagnostic monitoring
- Maximum power consumption <2.5W
- Utilizes a standard 12/8 lane optical fiber with MPO connector
- RoHS 6 compliant(lead free)
- 4x28Gb/s 850nm VCSEL-based transmitter

Applications

- 100GBASE-SR4 Ethernet
- OTN OTU4
- 128G Fiber Channel

Absolute Maximum Ratings

Parameter	Symbol	Min.	Max.	Units	Note
Storage Temperature	T_s	-40	85	°C	
Relative Humidity (non-condensation)	RH		85	%	
Operating Case Temperature	T_{OP}	0	70	°C	
Supply Voltage	V_{CC}	-0.5	3.6	V	
Voltage on LVTTTL Input	V_{ilvttl}	-0.5	VCC3+0.3	V	
LVTTTL Output Current	I_{olvttl}		15	mA	
Voltage on Open Collector Output	V_{oco}	0	6	V	
Damage Threshold, each Lane	TH_d	3.4		dBm	1

Notes :

1. PIN receiver.

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			25.78125		Gb/s	1
Data Rate, each Lane			27.9525		Gb/s	2
Control Input Voltage High		2		V_{CC}	V	
Control Input Voltage Low		0		0.8	V	
Power Supply Noise	V_{rip}			2	%	DC-1MHz
				3	%	1-10MHz
Link Distance (OM3 MMF)	$D1$			70	m	
Link Distance (OM4 MMF)	$D2$			100	m	
Power Consumption				2.5	W	
Supply Current	I_{CC}			800	mA	
Low Power Mode Power Dissipation				1	W	

Notes :

- 1.100GBASE-SR4.
2. OUT4 with FEC.

Transmitter Electro-optical Characteristics

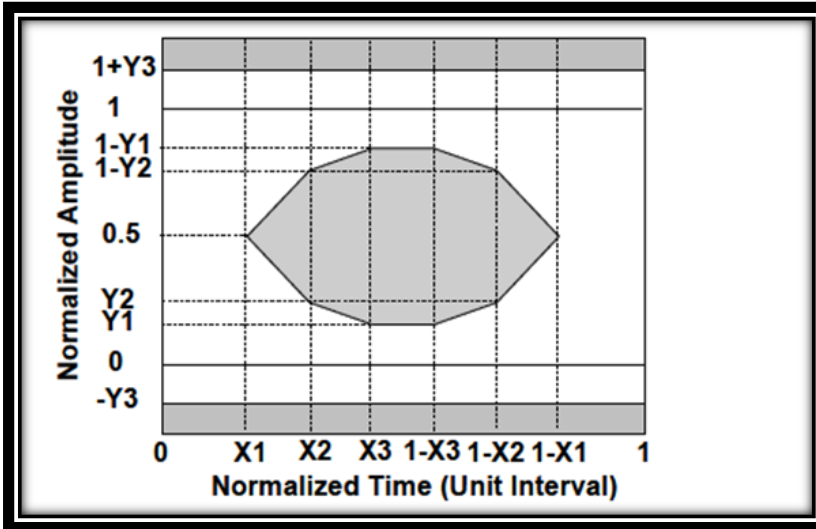
$V_{CC} = 3.135\text{ V to }3.465\text{ V}$, $T_C = 0\text{ }^\circ\text{C to }70\text{ }^\circ\text{C}$

Parameter	Symbol	Min.	Typ.	Max.	Units	Note
Single-ended Input Voltage Tolerance (Note 1)		-0.3		4.0	V	Referred to TP1 signal common
AC Common Mode Input Voltage Tolerance		15			mV	RMS
Differential Input Voltage Swing Threshold		50			mVpp	LOSA Threshold
Differential Input Voltage Swing	$V_{in,pp}$	190		700	mVpp	
Differential Input Impedance	Z_{in}	90	100	110	Ohm	
Center Wavelength	λ_C	840	850	860	nm	
RMS Spectral Width	$\Delta\lambda_{rms}$			0.6	nm	
Average Launch Power, each Lane	P_{AVG}	-8.4		2.4	dBm	
Optical Modulation Amplitude (OMA), each Lane	P_{OMA}	-6.4		3.0	dBm	2
Difference in Launch Power between any Two Lanes (OMA)	$P_{tx,diff}$			4.0	dB	
Launch Power in OMA minus TDEC, each Lane		-7.3			dBm	
Transmitter and Dispersion Eye Closure (TDEC), each Lane				4.3	dB	
Extinction Ratio	ER	2.0			dB	
Optical Return Loss Tolerance	TOL			12	dB	
Encircled Flux				$\geq 86\%$ at 19um $\leq 30\%$ at 4.5um		
Transmitter Eye Mask Definition {X1, X2, X3, Y1, Y2, Y3}, 5×10^{-5} hits/sample				{0.3,0.38,0.45,0.35,0.41,0.5}		3
Average Launch Power OFF Transmitter, each Lane	P_{off}			-30	dBm	

Notes:

1. The single ended input voltage tolerance is the allowable range of the instantaneous input signals.
2. Even if the TDP < 0.9 dB, the OMA min must exceed the minimum value specified here.

3. Stressed eye closure and stressed eye jitter are test conditions for measuring stressed receiver sensitivity. They are not characteristics of the receiver.



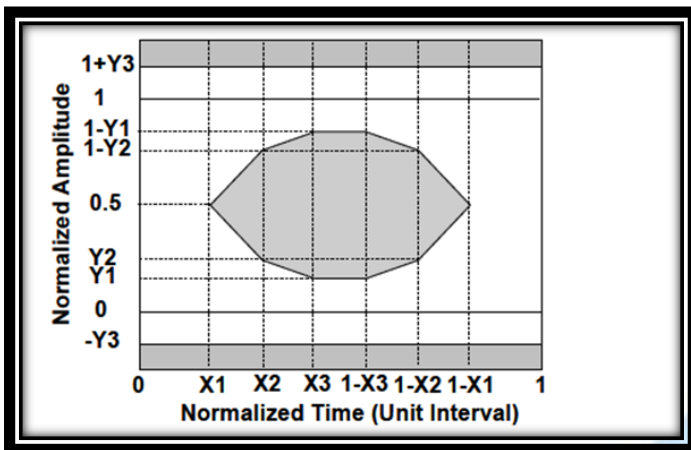
Receiver Electro-optical Characteristics

$V_{CC} = 3.135\text{ V to }3.465\text{ V}$, $T_C = 0\text{ }^\circ\text{C to }70\text{ }^\circ\text{C}$

Parameter	Symbol	Units	Min.	Typ.	Max.	Note
Single-ended Output Voltage			-0.3	4.0	V	Referred to signal common
AC Common Mode Output Voltage				7.5	mV	RMS
Differential Output Voltage Swing	$V_{out,pp}$	300		850	mVpp	
Differential Output Impedance	Z_{ou}	90	100	110	Ohm	
Termination Mismatch at 1MHz				5	%	
Center Wavelength	λ_C	840	850	860	nm	
Damage Threshold, each Lane	TH_d	3.4			dBm	1
Average Receive Power, each Lane		-10.3		2.4	dBm	
Receiver Reflectance	R_R			-12	dB	
Receive Power (OMA), each Lane				3.0	dBm	
Stressed Receiver Sensitivity (OMA), each Lane				-5.2	dBm	2
LOS Assert	$LOSA$	-30			dBm	
LOS Deassert	$LOSD$			-12	dBm	
LOS Hysteresis	$LOSH$	0.5	2		dB	
Stressed Eye Closure (SEC), Lane under Test			4.3		dB	3
Stressed Eye J2 Jitter, Lane under Test			0.39		UI	3
Stressed Eye J4 Jitter, Lane under Test				0.53	UI	3
OMA of each Aggressor Lane			3		dBm	3
Stressed receiver eye mask definition {X1, X2, X3, Y1, Y2, Y3}				{0.28,0.5,0.5,0.33,0.33,0.4}		3

Notes:

1. The receiver shall be able to tolerate, without damage, continuous exposure to a modulated optical input signal having this power level on one lane. The receiver does not have to operate correctly at this input power.
2. Measured with conformance test signal at receiver input for BER = 1×10^{-12} .
3. Stressed eye closure and stressed eye jitter are test conditions for measuring stressed receiver sensitivity. They are not characteristics of the receiver.



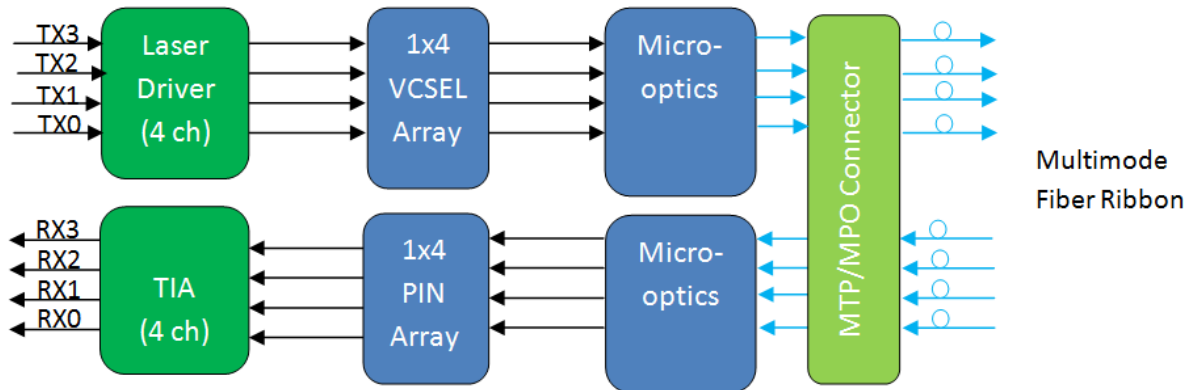
Digital Diagnostic Functions

Parameter	Symbol	Min.	Max.	Units	Note
Temperature monitor absolute error	<i>DMI_Temp</i>	-3	3	°C	Over operating temperature range
Supply voltage monitor absolute error	<i>DMI_VCC</i>	-0.15	0.15	V	Over full operating range
Channel RX power monitor absolute error	<i>DMI_RX_Ch</i>	-2	2	dB	1
Channel Bias current monitor	<i>DMI_Ibias_Ch</i>	-10%	10%	mA	Ch1~Ch4
Channel TX power monitor absolute error	<i>DMI_TX_Ch</i>	-2	2	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.

Block Diagram of Transceiver

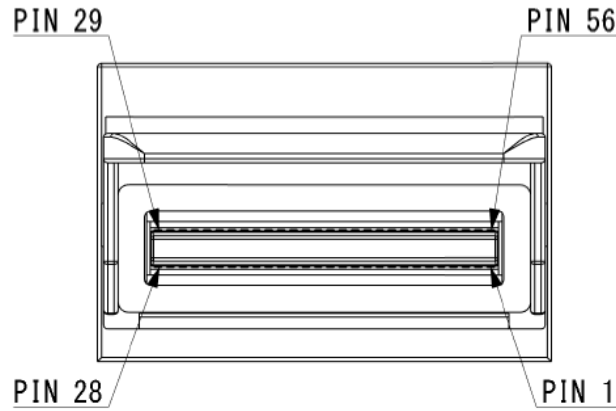


MDIO Interface Pins

PIN	Symbol	Description	I/O	Logic	"H"	"L"
13	GLB_ALRMn	Global Alarm	O	3.3V LVCMOS	OK	Alarm
18	MDIO	Management Data Input Output Bi-Directional Data	I/O	1.2V LVCMOS		
17	MDC	MDIO Clock	I	1.2V LVCMOS		
19	PRTADR0	MDIO port address bit 0	I	1.2V LVCMOS	per MDIO document	
20	PRTADR1	MDIO port address bit 1	I	1.2V LVCMOS		
21	PRTADR2	MDIO port address bit 2	I	1.2V LVCMOS		

Pin Assignment

CFP4 Connector Pin Map Orientation



CFP4	
Bottom	
1	3.3V_GND
2	3.3V_GND
3	3.3V
4	3.3V
5	3.3V
6	3.3V
7	3.3V_GND
8	3.3V_GND
9	VND_IO_A
10	VND_IO_B
11	TX_DIS (PRG_CNTL1)
12	RX_LOS (PRG_ALRM1)
13	GLB_ALRMn
14	MOD_LOPWR
15	MOD_ABS
16	MOD_RSTn
17	MDC
18	MDIO
19	PRTADR0
20	PRTADR1
21	PRTADR2
22	VND_IO_C
23	VND_IO_D
24	VND_IO_E
25	GND
26	(MCLKn)
27	(MCLKp)
28	GND

CFP4	
Top	
56	GND
55	TX3n
54	TX3p
53	GND
52	TX2n
51	TX2p
50	GND
49	TX1n
48	TX1p
47	GND
46	TX0n
45	TX0p
44	GND
43	(REFCLKn)
42	(REFCLKp)
41	GND
40	RX3n
39	RX3p
38	GND
37	RX2n
36	RX2p
35	GND
34	RX1n
33	RX1p
32	GND
31	RX0n
30	RX0p
29	GND

CFP4	
Top ALT1	
GND	GND
TX0n	TX0n
TX0p	TX0p
GND	GND
TX1n	TX1n
TX1p	TX1p
GND	GND
TX2n	TX2n
TX2p	TX2p
GND	GND
TX3n	TX3n
TX3p	TX3p
GND	GND
(REFCLKn)	(REFCLKn)
(REFCLKp)	(REFCLKp)
GND	GND
RX3p	RX3p
RX3n	RX3n
GND	GND
RX2p	RX2p
RX2n	RX2n
GND	GND
RX1p	RX1p
RX1n	RX1n
GND	GND
RX0p	RX0p
RX0n	RX0n
GND	GND

REFCLK
(Optional)

MCLK = TX_MCLK +
RX_MCLK
(Optional)

Pin Descriptions

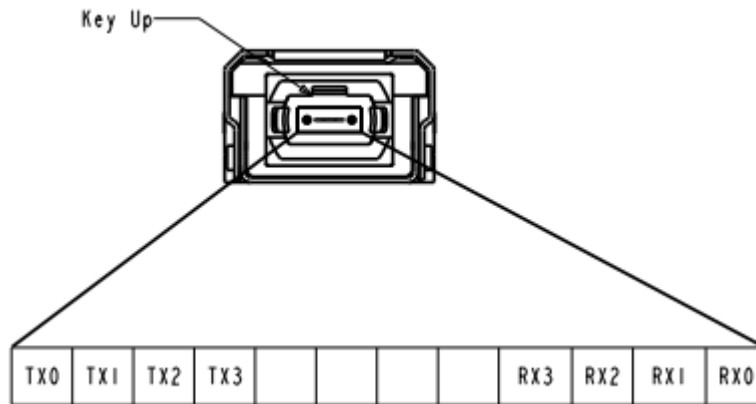
PIN	Name	I/O	Logic	Description
1	3.3V_GND			3.3V Module Supply Voltage Return Ground, can be separated or tied together with Signal Ground
2	3.3V_GND			GND
3	3.3V			3.3V Module Supply Voltage
4	3.3V			3.3V Module Supply Voltage
5	3.3V			3.3V Module Supply Voltage
6	3.3V			3.3V Module Supply Voltage
7	3.3V_GND			GND
8	3.3V_GND			GND
9	VIND_IO_A	I/O		Module Vendor I/O A. Do Not Connect
10	VIND_IO_B	I/O		Module Vendor I/O B. Do Not Connect
11	TX_DIS (PRG_CNT L1)	I	LVC MOS w/PUR	Transmitter Disable for all lanes. "1" or NC: Transmitter disabled; "0": transmitter enabled.(Optionally configurable as Programmable Control1 after Reset)
12	RX_LOS (PRG_ALR M1)	O	LVC MOS w/PUR	Receiver Loss of Optical Signal. "1": low optical signal; "0":normal condition (Optionally configurable as Programmable Alarm1 after Reset)
13	GLB_ALR Mn	O	LVC MOS	Global Alarm. "0":alarm condition in any MDIO Alarm register; "1": no alarm condition, Open Drain, Pull up Resistor on Host
14	MOD_LOP WR	I	LVC MOS w/PUR	Module Low Power Mode. "1" or NC: module in low power (safe) mode; "0":power-on enabled
15	MOD_ABS	O	GND	Module Absent. "1" or NC: module absent; "0": module present, Pull up resistor on Host
16	MOD_RST n	I	LVC MOS w/PDR	Module Reset. "0": resets the module; "1" or NC: module enabled, Pull down Resistor in Module
17	MDC	I	1.2V CMOS	Management Data Clock (electrical specs as per IEEE Std 802.3-2012)
18	MDIO	I/O	1.2V CMOS	Management Data I/O bi-directional data(electrical specs as per IEEE Std 802.3ae-2008 and ba-2010)

19	PRTADR0	I	1.2V CMOS	MDIO Physical Port address bit 0
20	PRTADR1	I	1.2V CMOS	MDIO Physical Port address bit 1
21	PRTADR2	I	1.2V CMOS	MDIO Physical Port address bit 2
22	VND_IO_C	I/O		Module Vendor I/O C. Do Not Connect
23	VND_IO_D	I/O		Module Vendor I/O D. Do Not Connect
24	VND_IO_E	I/O		Module Vendor I/O E. Do Not Connect
25	GND			GND
26	(MCLKn)	O	CML	For optical waveform testing. Not for normal use
27	(MCLKp)	O	CML	For optical waveform testing. Not for normal use
28	GND			GND

Definition of Top Side Pins

PIN	Name		PIN	Name
29	GND		43	(REFCLKp)
30	RX0p		44	GND
31	RX0n		45	TX0p
32	GND		46	TX0n
33	RX1p		47	GND
34	RX1n		48	TX1p
35	GND		49	TX1n
36	RX2p		50	GND
37	RX2n		51	TX2p
38	GND		52	TX2n
39	RX3p		53	GND
40	RX3n		54	TX3p
41	GND		55	TX3n
42	(REFCLKn)		56	GND

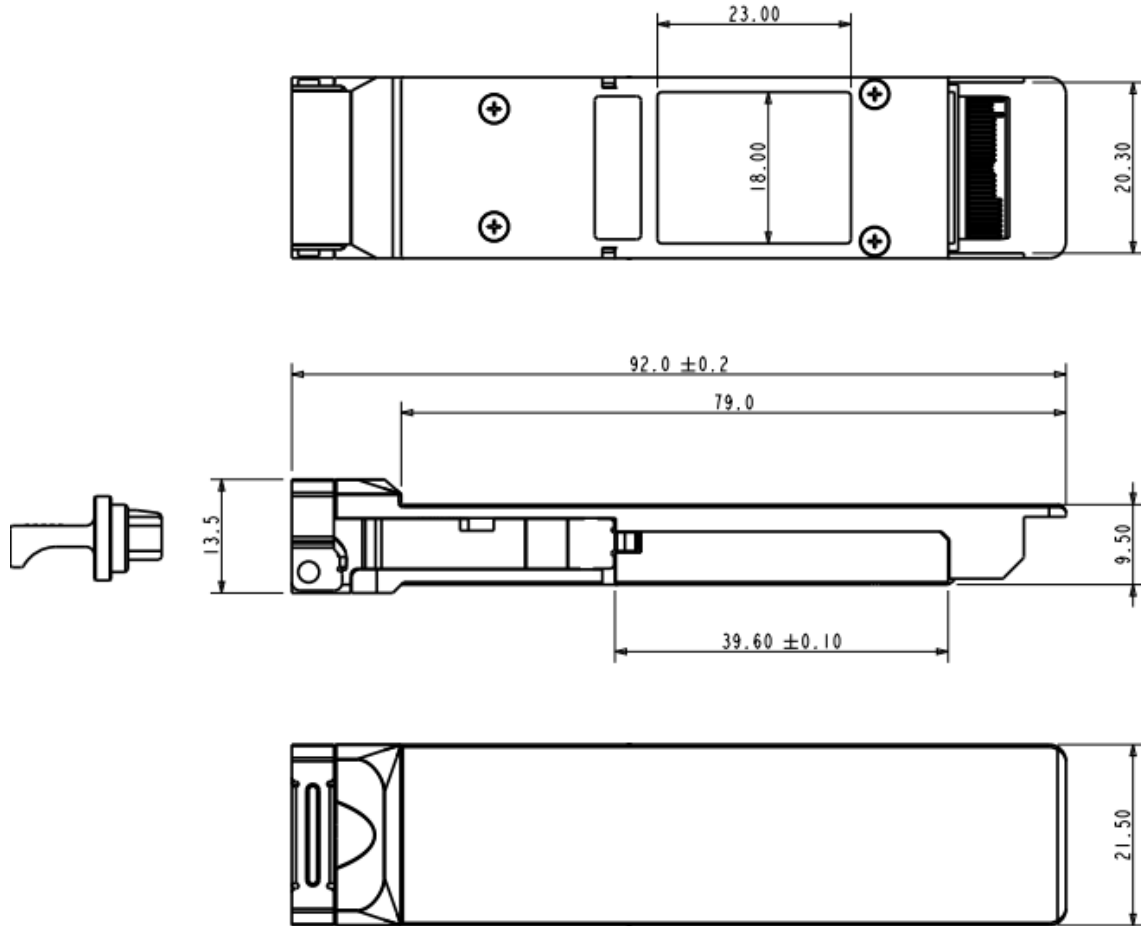
Outside View of the CFP4 Module MPO Receptacle



Lane Assignment

Fiber #	Lane Assignment
1	RX0
2	RX1
3	RX2
4	RX3
5,6,7,8	Not used
9	TX3
10	TX2
11	TX1
12	TX0

Dimensions



ESD

This transceiver is specified as ESD threshold 2kV for all electrical input pins, tested per MIL-STD-883, Method 3015.4 /JESD22-A114-A (HBM). However, normal ESD precautions are still required during the handling of this module. This transceiver is shipped in ESD protective packaging. It should be removed from the packaging and handled only in an ESD protected environment.

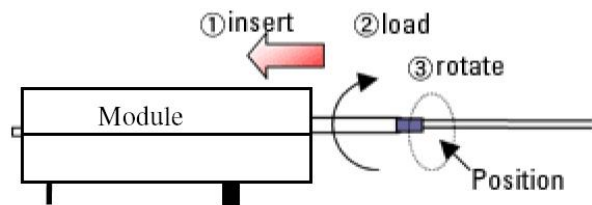
Optical Receptacle Cleaning Recommendations:

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

OP H W - M X1 - 85 - C F

<p>↑</p> <p>Product Code:</p> <p>5=GBIC; 6=SFP-LC; 7=XFP; 8=XENPAK; 9=X2; A=SFP+ (SFP28); C=QSFP+ (QSFP28); F=CFP; G=CFP2; H=CFP4; P=SFP-SC; Q=SFP-MTRJ</p>	<p>↑</p> <p>Data Rate:</p> <p>A=155Mb/s; B=622Mb/s; C=1.25Gb/s; D=2.125Gb/s; E=2.5Gb/s; F=4.25Gb/s; G=3.1Gb/s; J=2.97G; P=6.144G; Q=7.37G; H=8.5Gb/s; K=10Gb/s; T=1/10Gb/s; L=16Gb/s; R=20Gb/s; X=25Gb/s; S=40Gb/s; W=100Gb/s (4x25G or 10x10G); M=100Base-X SGMII; N=100/1000Base-X SGMII;</p>	<p>↑</p> <p>Type: S=Single-mode; M=Multi-mode; W=BWDM; B=DUAL-BWDM; C=CWDM; D=DWDM; T=Copper-T (RJ-45) E=GEPON ONU; F=GEPON OLT; G=GPON ONU; H=GPON OLT X=MMF/SMF</p>	<p>↑</p> <p>Reach:</p> <p>Normal: X1=Under 150m; X2=220m; X3=300m; X5=550m; O2=2km, 10=10km; 70=70km; A0=100km; C0=120km</p> <p>CWDM: 20=20dB; 24=24dB; 28=28dB</p>	<p>↑</p> <p>Wavelength:</p> <p>Normal: 85=850nm; 13=1310nm; 15=1550nm; 00=Copper T (RJ-45)</p> <p>CWDM: 27=1270nm; 47=1470nm; 61=1610nm</p> <p>BWDM: B3=Tx1310/Rx1550; B5=Tx1550/Rx1310; B4=Tx1310/Rx1490; B9=Tx1490/Rx1310; 51=Tx1510/Rx1570; 57=Tx1570/Rx1510; 27=Tx1270/Rx1330; 33=Tx1330/Rx1270; B2=Tx1270/Rx1577; B7=Tx1577/Rx1270 T2=2TX1310nm; T3=TX1310nm; T5=TX1550nm</p> <p>DWDM: 17=Channel 17 34= Channel 34 00=Channel 17~61 Tunable</p>	<p>↑</p> <p>Operating Temperature:</p> <p>C=Commercial Purpose (0~70°C); I= Industrial Purpose (Extended Range)</p>	<p>↑</p> <p>For Optech Internal Ref.</p>
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Model Number	Part Number	Distance	Voltage	Temperature
CFP4-100G-SR4	OPHW-MX1-85-CF	100m	3.3V	0°C to 70 °C

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