

1.6T 2xFR4 OSFP PAM4 Optical Transceiver

Jabil 1.6T 2xFR4 OSFP PAM4 Optical Transceiver is a small form-factor, high speed, and low power consumption product targeted for use in optical interconnects for data communications applications. The high bandwidth module supports dual 800G Ethernet or InfiniBand connections, or a single 1.6T Ethernet or InfiniBand connection over 2Km single mode dual pair of fibers.

FEATURES

- Compliant with IEEE 802.3dj
- 200Gbps/lane electrical and optical (8 lanes)
- OSFP1600 and OSFP1600-RHS form factor for high faceplate density in networking equipment
- Dual LC connector for single-mode WDM fiber infrastructures
- Reach up to 2Km
- Available with integrated heat sink (IHS flat top) or without heatsink (RHS)
- Typical power dissipation <26W
- Operating temperature range: 0 to 70°C
- CMIS-compliant management interface with full module diagnostics and control through I²C
- RoHS-6 Compliance

APPLICATIONS

- 1.6Tb/s connectivity, 2x800GbE breakout connectivity for large-scale cloud and enterprise data centers
- Ethernet and InfiniBand switches, routers, and client-side telecom interfaces

STANDARDS

- IEEE 802.3-2022, IEEE P802.3dj
- OSFP MSA



ABSOLUTE MAXIMUM RATINGS

Stresses beyond those listed under “absolute maximum ratings” may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied. Exposure to absolute maximum rated conditions for extended periods may affect device reliability.

PARAMETER	SYMBOL	MIN	MAX	UNITS
Storage Temperature	Tstg	-40	+85	°C
Case Operating Temperature	TOP	0	70	°C
Relative Humidity – Storage (*)	RHS	5	95	%
Relative Humidity – Operating	RHO	5	85	%
DC Supply Voltage	V _{cc}	-0.5	3.6	V
Receiver Input Optical Power	PIN (max)	-	+3.5	dBm

(*) not condensing

RECOMMENDED OPERATING CONDITIONS

PARAMETER	SYMBOL	MIN	TYP	MAX	UNITS
Case Operating Temperature	TCASE	0	30	70	°C
DC Supply Voltage	V _{cc}	3.135	3.3	3.465	V
Power Supply Noise Tolerance (*)		-	-	50	mVpp

(*) At input to recommended power supply filter

Optical Transmitter

TRANSMITTER ELECTRICAL CHARACTERISTICS (TP1)

PARAMETER	SYMBOL	MIN	TYP	MAX	UNITS	NOTES
Data modulation type		PAM4				
Baud/symbol rate, each lane	BR	106.25 ± 50ppm			GBd	
Differential termination mismatch		10			%	
Effective return loss	ERL	8.5	-	-	dB	
Peak-to-peak AC common-mode voltage tolerance Full-band	VCM _{FB}			60	mV	

Optical Transmitter

TRANSMITTER OPTICAL CHARACTERISTICS (TP2)

PARAMETER	SYMBOL	MIN	TYP	MAX	UNITS	NOTES
Data modulation type		PAM4				
Baud/symbol rate, each lane	BR	113.4375 ± 50 ppm			GBd	
Lane wavelengths	WL	1264.5	1271	1277.5	nm	
		1284.5	1291	1297.5		
		1304.5	1311	1317.5		
		1324.5	1331	1337.5		
Side Mode Suppression Ratio	SMSR	30	-	-	dB	
Average optical output power, each lane	Pave	-2.2	-	4.9	dBm	1
Optical Modulation Amplitude, each lane	OMA _{outer}	0.8	-	4.8	dBm	
for max (TECQ, TDECQ) <0.9 dB						
for 0.9 dB ≤ max (TECQ, TDECQ) ≤ 3.4 dB		IEEE P802.3dj Equation (183-1)				
Transmitter and dispersion eye closure for PAM4, each lane	TDECQ	-	-	3.4	dB	
Transmitter eye closure for PAM4, each lane	TECQ	-	-	3.4	dB	
Extinction Ratio	ER	3.5	-	-	dB	
Transmitter reflectance		-	-	-26	dB	2
RIN _{17.1OMA}	RIN	-	-	-139	dB/Hz	
Optical Return Loss Tolerance	ORLT	-	-	17.1	dB	
Operating link reach		2	-	2000	m	

(1) Average launch power, each lane (min) is not the principal indicator of signal strength. A transmitter with launch power below this value cannot be compliant; however, a value above this does not ensure compliance. Average launch power of -2.2 dBm corresponds to an OMA of 0.8 dBm with an infinite extinction ratio.

(2) Transmitter reflectance is defined looking into the transmitter.

Optical Receiver

RECEIVER OPTICAL CHARACTERISTICS (TP3)

PARAMETER	SYMBOL	MIN	TYP	MAX	UNITS	NOTES
Data modulation type		PAM4				
Baud/symbol rate, each lane	BR	113.4375 ± 50 ppm			GBd	
Input Operating Wavelength	WL	1264.5	1271	1277.5	nm	
		1284.5	1291	1297.5		
		1304.5	1311	1317.5		
		1324.5	1331	1337.5		
Average receive power, each lane		-6.2	-	4.9	dBm	
Receive power OMA _{outer} , each lane		-	-	4.8	dBm	
Damage threshold, each lane		-	-	5.9	dBm	1
Receiver reflectance		-	-	-26	dB	
Receiver sensitivity (OMA _{outer}), each lane						
for TECQ < 0.9 dB		-	-	-3.7	dBm	
for 0.9 dB ≤ TECQ ≤ SECQ				-4.6 + TECQ		
Stressed Receiver Sensitivity (OMA _{outer}), each lane	SRS	-	-	-1.2	dBm	
Stressed eye closure for PAM4 (SECQ), each lane	SECQ	3.4			dB	2
OMA _{outer} of each aggressor lane		0.8			dBm	2

(1) The receiver can tolerate, without damage, continuous exposure to a signal having this average optical power level.

(2) These test conditions are for measuring stressed receiver sensitivity. They are not characteristics of the receiver.

Optical Receiver

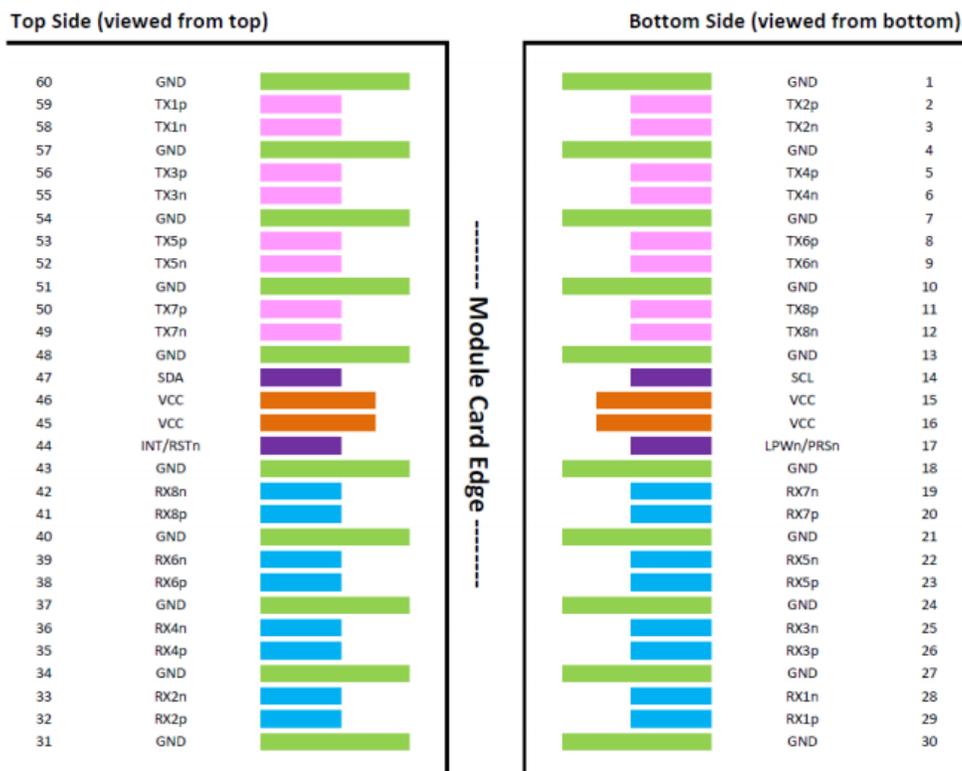
RECEIVER ELECTRICAL CHARACTERISTICS (TP4)

PARAMETER	SYMBOL	MIN	TYP	MAX	UNITS	NOTES
Data modulation type		PAM4				
Baud/symbol rate, each lane	BR	106.25 ± 50 ppm			GBd	
DC common mode voltage	V_{out_AC-CM}	-50	-	1050	mV	
Differential peak-to-peak output voltage	V_{out_pp}	-	-	600	mVpp	
Differential termination mismatch		-	-	10	%	

Electrical PIN Assignment

The optical transceiver pinout is compliant with the OSFP MSA specifications. Figure below shows the module connector pad layout, and table below lists and describes all of the electrical pins of the module.

ELECTRICAL CONNECTOR PAD LAYOUT



OSFP MODULE ELECTRICAL CONNECTOR PIN DEFINITIONS:

NAME	DIRECTION	DESCRIPTION
TX[8:1]p	input	Transmit differential pairs non-inverted from host to module.
TX[8:1]n	input	Transmit differential pairs inverted from host to module.
RX[8:1]p	output	Receive differential pairs non-inverted from module to host.
RX[8:1]n	output	Receive differential pairs inverted from module to host.
SCL	bidir	2-wire serial clock signal. Requires pull-up resistor to 3.3V on host.
SDA	bidir	2-wire serial data signal. Requires pull-up resistor to 3.3V on host.
PWn/PRSn	bidir	Multi-level signal for low power control from host to module and module presence indication from module to host.
INT/RSTn	bidir	Multi-level signal for interrupt request from module to host and reset control from host to module.
VCC	power	3.3V power for module.
GND	ground	Module Ground. Logic and power return path.

PIN#	SYMBOL	DESCRIPTION	LOGIC	DIRECTION	PLUG SEQUENCE ²	NOTES
1	GND	Ground			1	
2	TX2p	TX Non-Inverted	CML-I	Input from Host	3	
3	TX2n	TX Inverted	CML-I	Input from Host	3	
4	GND	Ground			1	
5	TX4p	TX Non-Inverted	CML-I	Input from Host	3	
6	TX4n	TX Inverted	CML-I	Input from Host	3	
7	GND	Ground			1	
8	TX6p	TX Non-Inverted	CML-I	Input from Host	3	
9	TX6n	TX Inverted	CML-I	Input from Host	3	
10	GND	Ground			1	
11	TX8p	TX Non-Inverted	CML-I	Input from Host	3	
12	TX8n	TX Inverted	CML-I	Input from Host	3	

PIN#	SYMBOL	DESCRIPTION	LOGIC	DIRECTION	PLUG SEQUENCE ²	NOTES
13	GND	Ground			1	
14	SCL	2-wire Serial interface clock	LVC MOS-I/O	Bi-directional	3	1
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	Multi-Level	Bi-directional	3	
18	GND	Ground			1	
19	RX7n	RX Inverted	CML-O	Output to Host	3	
20	RX7p	RX Non-Inverted	CML-O	Output to Host	3	
21	GND	Ground			1	
22	RX5n	RX Inverted	CML-O	Output to Host	3	
23	RX5p	RX Non-Inverted	CML-O	Output to Host	3	
24	GND	Ground			1	
25	RX3n	RX Inverted	CML-O	Output to Host	3	
26	RX3p	RX Non-Inverted	CML-O	Output to Host	3	
27	GND	Ground			1	
28	RX1n	RX Inverted	CML-O	Output to Host	3	
29	RX1p	RX Non-Inverted	CML-O	Output to Host	3	
30	GND	Ground			1	
31	GND	Ground			1	
32	RX2p	RX Non-Inverted	CML-O	Output to Host	3	
33	RX2n	RX Inverted	CML-O	Output to Host	3	
34	GND	Ground			1	
35	RX4p	RX Non-Inverted	CML-O	Output to Host	3	
36	RX4n	RX Inverted	CML-O	Output to Host	3	
37	GND	Ground			1	

PIN#	SYMBOL	DESCRIPTION	LOGIC	DIRECTION	PLUG SEQUENCE ²	NOTES
38	RX6p	RX Non-Inverted	CML-O	Output to Host	3	
39	RX6n	RX Inverted	CML-O	Output to Host	3	
40	GND	Ground			1	
41	RX8p	RX Non-Inverted	CML-O	Output to Host	3	
42	RX8n	RX 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	LVC MOS-I/O	Bi-directional	3	1
48	GND	Ground			1	
49	TX7n	TX Inverted	CML-I	Input from Host	3	
50	TX7p	TX Non-Inverted	CML-I	Input from Host	3	
51	GND	Ground			1	
52	TX5n	TX Inverted	CML-I	Input from Host	3	
53	TX5p	TX Non-Inverted	CML-I	Input from Host	3	
54	GND	Ground			1	
55	TX3n	TX Inverted	CML-I	Input from Host	3	
56	TX3p	TX Non-Inverted	CML-I	Input from Host	3	
57	GND	Ground			1	
58	TX1n	TX Inverted	CML-I	Input from Host	3	
59	TX1p	TX Non-Inverted	CML-I	Input from Host	3	
60	GND	Ground			1	

(1) Open-Drain with pull up resistor on Host.

(2) Plug Sequence specifies the mating sequence of the host connector and module. The sequence is 1,2,3.

Mechanical Specifications

The module housing, mechanical features, and electrical connector are compliant with OSFP MSA mechanical specifications for OSFP1600 and OSFP1600-RHS. The module optical connector is dual LC connector.

Label Specification

The following printed label is attached to the product (note that the certification labels will be added/removed according to requests and certification process results):



Regulatory and Compliance

EMC – Immunity	<ul style="list-style-type: none"> EN 55024 (EU) IEC EN 61000-4-3 (International) 	<ul style="list-style-type: none"> EMC Directive 89/336/EEC IEC /CISPR/24
EMC – Emission	<ul style="list-style-type: none"> CISPR 22, class B (Comité International Spécial des Perturbations Radioélectriques-CISPR; Special international committee on radio interference. International). AS/NZS CISPR22 (Australia/New Zealand) 	<ul style="list-style-type: none"> VCCI-03 (Japan) FCC 47 CFR Part 15, class B (US) ICES-003, Issue 4 (Canada) EN 55022 (EU) EMC Directive 2004/108/EEC (EU)
ESD Threshold	<ul style="list-style-type: none"> Per MIL-STD 883C Method 3015.4 or ANSI/ESDA/JEDEC JS-001-2012 (component level). IEC EN 61000-4-2; +/- 8kV contact, +/- 15kV air. 	
Product Safety	<ul style="list-style-type: none"> UL Recognized Component: UL 60950-1 (2nd Ed.) Information Technology Equipment; CAN/CSA-C22.2 No. 60950-1 (2007) Information Technology Equipment; UL94-V0 flammability. CB Certificate: IEC 60950-1 (2005 +A1:2009) Information Technology Equipment. 	
Fire Safety	<ul style="list-style-type: none"> PCB material must be fully compliant to UL796; Temperature class B (IEC 60085); flammability class V-0- UL94). Cables and connectors must have a flammability ratings of V0- UL94; Service temp.≥90 C. Label materials must have a flammability ratings of V0- UL94; Service temp.≥90 C. Optical fibers must have a flammability ratings of V0- UL94; Service temp.≥85 C. 	
Optical Safety	<ul style="list-style-type: none"> FDA/CDRH certified with accession number, Class 1 laser product: <ul style="list-style-type: none"> U.S. 21 CFR 1040; UL mark 	<ul style="list-style-type: none"> UL Certificate: <ul style="list-style-type: none"> IEC 60825-1:2014; EN 60825-1:2014 + A11:2021 Complies with 21 CFR 1040.10 and 1040.11 except for conformance with IEC 60825-1 Ed. 3., as described in Laser Notice No. 56, dated May 8, 2019. Caution – Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.
RoHS	<ul style="list-style-type: none"> 2002/95/EC and the revised and recast Directive 2011/65/EC (RoHS) Restriction on Hazardous Substances. 2006/1907/EC (REACH) Registration, Evaluation, Authorization of Chemicals. 	<ul style="list-style-type: none"> JIG 101-A, JIG 101-B Joint Industry Guide Japanese Material Composition Declaration. CAITEC SJ/T 11363-2006 Requirements for Concentration Limits for Certain Hazardous Substances in Electronic Information Products (China RoHS) Complies with RoHS II Directive 2011/65/EU.

Ordering Information

JABIL PART NUMBER	PACKAGE	RATE	REACH	OTHER INFO
OS8DIRLCCxx0CL4	OSFP	1.6T 2xFR4	2Km	C-Temp, Flat Top, dual LC
OS8DIRLCCxxSCL4	OSFP	1.6T 2xFR4	2Km	C-Temp, RHS, dual LC

Document Version

VERSION	DATE	NOTES
1.0	1/15/2025	Initial specification version

Manufacturer's Address

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For additional information, visit
jabil.com

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