OSFP 800GE 2 x FR4 2 km

Datasheet

Issue	**1.1**
Date	**2025-10-28**

Contents

1 Features and Applications

Features

- 850 Gbps aggregate bit rate
- Non-hermetic package design
- 2 x CWDM4 lanes MUX/DeMUX design
- Dual duplex LC connector
- Maximum power consumption 17 W
- Single 3.3 V power supply
- Up to 2 km transmission on single mode fibers with FEC
- OSFP MSA rev5.0 compliant
- 100G Lambda MSA compliant
- 802.3cu compliant
- OIF CMIS 5.2 Management Interface compliant
- Compliant to OIF-CEI-112G-VSR-PAM4
- RoHS 2 compliant

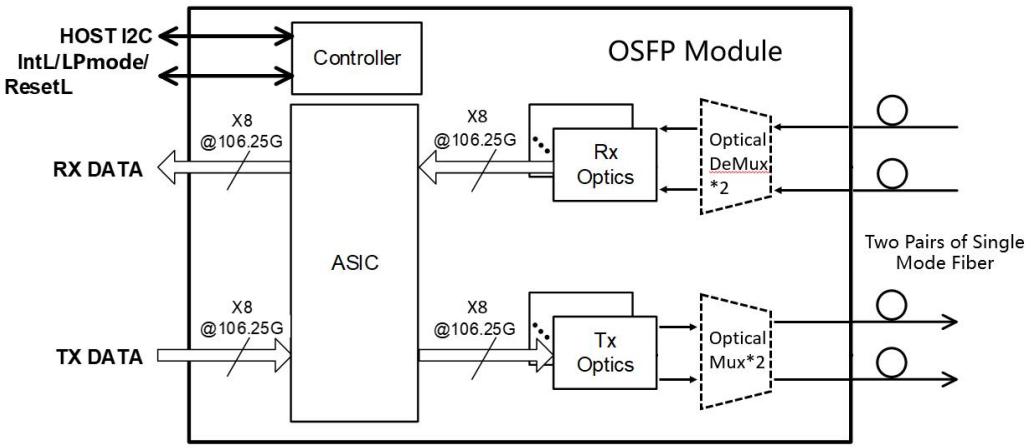
Applications

- 800G Ethernet
- Data center network

2 Description

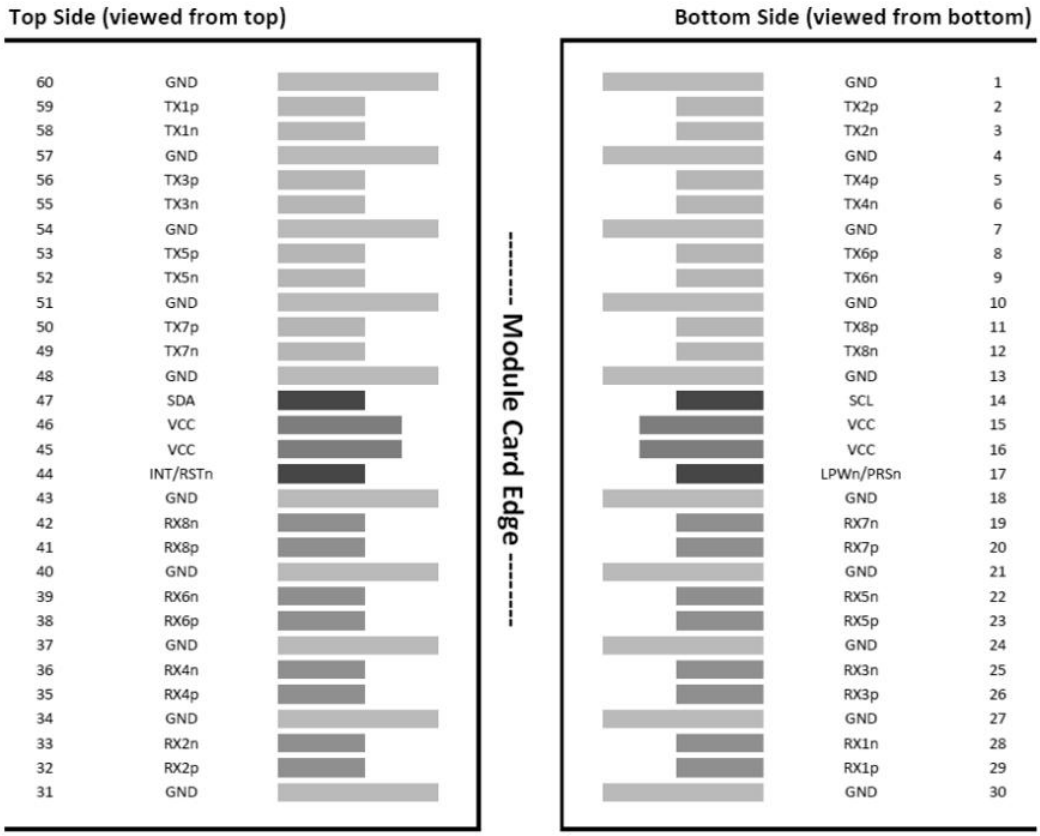
The OSFP 800GE 2 x FR4 2km is a transceiver module designed for use in 800 Gigabit links on up to 2 km. It is well-suited for applications in data centers and cloud networks. It is compliant with 100G Lambda MSA standard and CMIS 5.2. Digital diagnostic functions are available via the I2C interface. This module can convert 8-channel 106.25 Gbps electrical data to 8-channel 106.25 Gbps optical signals, and multiplex them into two channels for 850 Gbps optical transmission. Similarly, it optically de-multiplexes a 850 Gbps input into 8-channel signals, and converts them to 8-channel output electrical data on the receiver side. It has been designed to meet the harshest external operating conditions including temperature, humidity and EMI interference. It also can be used as 2 x 400GE breakout to 400G-FR4 modules.

Figure 2-1 Transceiver block diagram



3 Pin Description

Figure 3-1 OSFP MSA compliant connector



Pin	Logic	Symbol	Description	Plug Sequence	Note
1	-	GND	Ground	1	-
2	CML-I	TX2p	Transmitter Data Non-Inverted	3	-
3	CML-I	TX2n	Transmitter Data	3	-

Pin	Logic	Symbol	Description	Plug Sequence	Note
			Inverted		
4	-	GND	Ground	1	-
5	CML-I	Tx4p	Transmitter Data Non-Inverted	3	-
6	CML-I	Tx4n	Transmitter Data Inverted	3	-
7	-	GND	Ground	1	-
8	CML-I	TX6p	Transmitter Data Non-Inverted	3	-
9	CML-I	TX6n	Transmitter Data Inverted	3	-
10	-	GND	Ground	1	-
11	CML-I	TX8p	Transmitter Data Non-Inverted	3	-
12	CML-I	TX8n	Transmitter Data Inverted	3	-
13	-	GND	Ground	1	-
14	LVCMOS-I/O	SCL	2-wire Serial Interface Clock	3	Open-Drain with pull-up resistor on Host
15	-	VCC	+3.3 V Power	2	-
16	-	VCC	+3.3 V Power	2	-
17	Multi-Level	LPWn/PRSn	Low-Power Mode/Module Present	3	See pin description for required circuit
18	-	GND	Ground	1	-
19	CML-O	RX7n	Receiver Data Inverted	3	-
20	CML-O	RX7p	Receiver Data Non-Inverted	3	-
21	-	GND	Ground	1	-
22	CML-O	RX5n	Receiver Data Inverted	3	-
23	CML-O	RX5p	Receiver Data	3	-

Pin	Logic	Symbol	Description	Plug Sequence	Note
			Non-Inverted		
24	-	GND	Ground	1	-
25	CML-O	RX3n	Receiver Data Inverted	3	-
26	CML-O	RX3p	Receiver Data Non-Inverted	3	-
27	-	GND	Ground	1	-
28	CML-O	RX1n	Receiver Data Inverted	3	-
29	CML-O	RX1p	Receiver Data Non-Inverted	3	-
30	-	GND	Ground	1	-
31	-	GND	Ground	1	-
32	CML-O	RX2p	Receiver Data Non-Inverted	3	-
33	CML-O	RX2n	Receiver Data Inverted	3	-
34	-	GND	Ground	1	-
35	CML-O	RX4p	Receiver Data Non-Inverted	3	-
36	CML-O	RX4n	Receiver Data Inverted	3	-
37	-	GND	Ground	1	-
38	CML-O	RX6p	Receiver Data Non-Inverted	3	-
39	CML-O	RX6n	Receiver Data Inverted	3	-
40	-	GND	Ground	1	-
41	CML-O	RX8p	Receiver Data Non-Inverted	3	-
42	CML-O	RX8n	Receiver Data Inverted	3	-
43	-	GND	Ground	1	-
44	Multi-Level	INT/RSTn	Module Interrupt/Module Reset	3	See pin description for required

Pin	Logic	Symbol	Description	Plug Sequence	Note
					circuit
45	-	VCC	+3.3 V Power	2	-
46	-	VCC	+3.3 V Power	2	-
47	LVCMOS-I/O	SDA	2-wire Serial Interface Data	3	Open-Drain with pull-up resistor on Host
48	-	GND	Ground	1	-
49	CML-I	TX7n	Transmitter Data Inverted	3	-
50	CML-I	TX7p	Transmitter Data Non-Inverted	3	-
51	-	GND	Ground	1	-
52	CML-I	TX5n	Transmitter Data Inverted	3	-
53	CML-I	TX5p	Transmitter Data Non-Inverted	3	-
54	-	GND	Ground	1	-
55	CML-I	TX3n	Transmitter Data Inverted	3	-
56	CML-I	TX3p	Transmitter Data Non-Inverted	3	-
57	-	GND	Ground	1	-
58	CML-I	TX1n	Transmitter Data Inverted	3	-
59	CML-I	TX1p	Transmitter Data Non-Inverted	3	-
60	-	GND	Ground	1	-

4 Absolute Maximum Ratings

It has to be noted that the operation in excess of any individual absolute maximum ratings might cause permanent damage to this module.

Parameter	Symbol	Min.	Typ.	Max.	Unit
Maximum supply voltage	Vcc	–0.3	3.3	3.6	V
Storage temperature	Ts	–40	-	85	°C
Relative humidity	RH	0	-	85	%

5 Operating Environments

Electrical and optical characteristics below are defined under this operating environment, unless otherwise specified.

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Supply voltage	Vcc	3.135	3.3	3.465	V	-
Case temperature	T	0	-	70	°C	-
Data rate accuracy	-	–100	-	100	ppm	-
Link distance	-	0.5	-	2000	m	Note 1

NOTE

1. G.652 single-mode optical fiber.

6 Electrical Characteristics

Parameter	Min.	Typ.	Max.	Unit	Condition
Power consumption	-	-	17	W	-
Supply current	-	-	5.15	A	-
Host-to-Module electrical specifications (module input)					
Overload differential voltage pk-pk	900	-	-	mV	See 25.3.12
Common mode voltage (Vcm)	–350	-	2850	mV	See Note 1, 2
Differential termination resistance mismatch	-	-	10	%	At 1 MHz. See 25.3.6
Differential mode to common mode conversion (SCD11)	-	-	Equation (25-1)	dB	See Note 3
Effective return loss (ERL)	9	-	-	dB	See Note 4
Stressed input test	See Section 25.3.11.3				-

Note:

1. Vcm is defined in Table 1-2 General Definitions of Section 1.6. (See CEI-112G-VSR-PAM)
2. Vcm is generated by the host. Specification includes effects of ground offset voltage.
3. S-parameter specifications are based on a differential reference impedance of 100 Ω and a common mode reference impedance of 25 Ω.
4. ERL is based on the methodology in IEEE 802.3 [27] clause 95A.5. See Section 25.3.7.

Parameter	Min.	Typ.	Max.	Unit	Condition
Module-to-Host electrical specifications at TP4 (module output)					
Differential voltage, pk-pk	-	-	860	mV	See 25.3.4
Common mode voltage (Vcm)	–350	-	2850	mV	See Note 1, 2
Common mode noise, RMS	-	-	17.5	mV	See 25.3.5
Differential termination resistance mismatch	-	-	10	%	At 1 MHz. See 13.3.6
Common mode to differential mode conversion (SDC22)	-	-	Equation (25-2)	dB	See Note 3
Effective return loss (ERL)	9	-	-	dB	See Note 4
Common mode return loss (SCC22)	-	-	–2 –1.6 – 0.1*f –8.5 + 0.13*f	dB	0.25 ≤ f ≤ 4 4 < f ≤ 30 30 < f ≤ min(0.8*fb, 43 GHz) See Note 3
Transition time	8.0	-	-	ps	See 16.C.4.1 except use a Bessel Thompson filter bandwidth of 43 GHz
Near-end vertical eye closure over ±50 mUI (VEC)	-	-	12	dB	See 25.3.11 See Note 5
Near-end eye height over ±50 mUI	20	-	-	mV	See 25.3.11 See Note 5
Far-end vertical eye closure over ±50 mUI (VEC)	TBD	-	12	dB	See 25.3.11 See Note 5
Far-end eye height over ±50 mUI	15	-	-	mV	See 25.3.11 See Note 5
Note: 1. Vcm is defined in Table 1-2 General Definitions of Section 1.6. (See					

Parameter	Min.	Typ.	Max.	Unit	Condition
CEI-112G-VSR-PAM) 2. Vcm is generated by the host. Specification includes effects of ground offset voltage. 3. S-parameter specifications are based on a differential reference impedance of 100 Ω and a commonmode reference impedance of 25 Ω. 4. ERL is based on the methodology in IEEE 802.3 [27] clause 95A. See Section 25.3.7. 5. Open eye is generated through the use of a reference Continuous Time Linear Equalizer (CTLE) and Decision Feedback Equalizer (DFE) applicable to all three PAM4 eyes. (See 25.3.11.4)					

7 Optical Characteristics

Parameter	Min.	Typ.	Max.	Unit
Transmitter				
Data rate, each Lane	53.125 ± 100 ppm			GBd
Modulation format	PAM4			-
Line wavelengths	1264.5	1271	1277.5	nm
	1284.5	1291	1297.5	
	1304.5	1311	1317.5	
	1324.5	1331	1337.5	
Total average launch power	-	-	9.3	dBm
Average launch power, each lane	–3.2	-	3.5	dBm
Optical modulation amplitude (OMA), each lane	–0.2	-	3.7	dBm
Extinction ratio (ER)	3.5	-	-	dB
Side-mode suppression ratio (SMSR)	30	-	-	dB
Launch power in OMA minus TDECQ, each lane	–1.6	-	-	dBm
Transmitter and dispersion eye closure for PAM4, each lane (TDECQ)	-	-	3.4	dB

Parameter	Min.	Typ.	Max.	Unit
Difference in launch power between any two lanes (OMAouter)	-	-	3.9	dB
RIN17.1OMA	-	-	–136	dB/Hz
Optical return loss tolerance	-	-	17.1	dB
Transmitter reflectance	-	-	–26	dB
Average launch power of off transmitter, each lane	-	-	–20	dBm
Receiver				
Data rate, each lane	53.125 ± 100 ppm			GBd
Modulation format	PAM4			-
Damage threshold, each lane	5.4	-	-	dBm
Line wavelengths	1264.5	1271	1277.5	nm
	1284.5	1291	1297.5	
	1304.5	1311	1317.5	
	1324.5	1331	1337.5	
Average receiver power, each lane	–7.3	-	4.4	dBm
Receiver power, each lane (OMA)	-	-	3.7	dBm
Difference in receiver power between any two lanes (OMA)	-	-	4.1	dB
Receiver sensitivity (OMAouter), each lane (max)	See Note			dBm
LOS assert	–20	-	-	dBm
LOS deassert	-	-	–8.6	dBm
LOS hysteresis	0.5	-	-	dB

Parameter	Min.	Typ.	Max.	Unit
Receiver reflectance	-	-	–26	dB
Conditions of stressed receiver sensitivity				
Stressed eye closure for PAM4 (SECQ), lane under test	-	3.4	-	dB
OMAouter of each aggressor lane	-	1.5	-	dBm

NOTE

Measured with conformance test signal (from Rx overload point to Rx sensitivity point) for Pre-FEC Bit Error Ratio < 1E–6, Post-FEC Bit Error Ratio = 0 and FEC symbol error distribution below 7. Rx Power max(OMA) for 2 x FR4: 3.7 dBm.

8 EEPROM Definitions

Refer to CMIS Rev5.2 used for OSFP.

9 Digital Diagnostic Monitoring Functions

Digital diagnostic management interface (DDMI) is realized by I2C interface in compliance with CMIS 5.2. Diagnostic management functions are realized, and the data addresses are listed in the form below.

Performance Item	Related Bytes	Monitor Error	Note
Module temperature	CMIS 5.2	≤ ±3°C	Note 1, 2
Module voltage	CMIS 5.2	≤ ±3%	Note 2
Transmitter optical power	CMIS 5.2	≤ ±2 dB	Note 2
Bias current	CMIS 5.2	≤ ±10%	Note 2
Receiver optical power	CMIS 5.2	≤ ±2 dB	Note 2
Laser temperature	CMIS 5.2	≤ ±3°C	Note 2
DSP (CDR) die temperature	Tx DSP (CDR) 1: Byte 70-71 Tx DSP (CDR) 2: Byte 72-73 Rx DSP (CDR) 1: Byte 74-75 Rx DSP (CDR) 2: Byte 76-77	≤ ±3°C	Note 2
SNR (Line)	Bank 00h Page 14h Byte 128 selector 06h, Byte 240-255	≤ ±1.5 dB	Note 2
LTP (Line)	Bank 00h Page 14h Byte 128 selector 06h, Byte 224-239	≤ ±1.5 dB	Note 2
Module work current	Byte 64-65	≤ ±10% mA	Note 2

Performance Item	Related Bytes	Monitor Error	Note
Module uptime	Byte 66-67	-	Note 2
Module power cycle	Byte 68-69	-	Note 2

NOTE

1. Actual temperature test point is fixed on module case around laser.
2. Full operating temperature range.

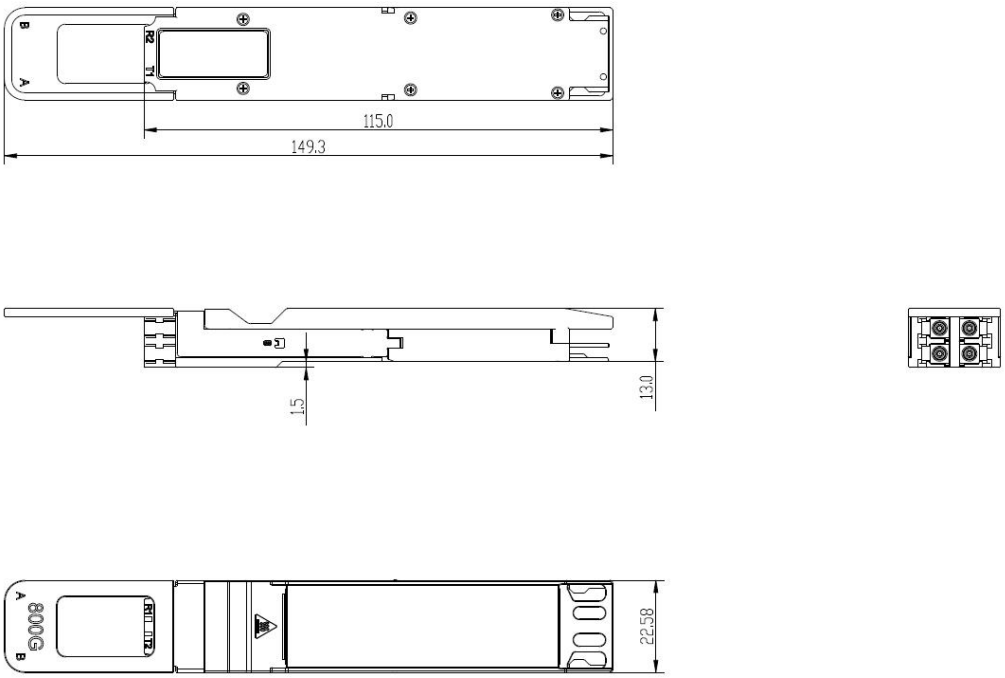
10 Alarm and Warning Thresholds

The OSFP 800GE 2 x FR4 2km module supports alarms function, indicating the values of the preceding basic performance are lower or higher than the thresholds.

Performance Item	Alarm Threshold Bytes (Page02h Memory)	Unit	Low Threshold	High Threshold
Temperature warning	132 to 135	°C	–3	73
Voltage warning	140 to 143	V	3.135	3.465
Tx power warning	180 to 183	dBm	–3.2	5.9
Rx power warning	196 to 199	dBm	–7.2	5.9
Temperature alarm	128 to 131	°C	–5	75
Voltage alarm	136 to 139	V	2.97	3.63
Tx power alarm	176 to 179	dBm	–6.2	7.4
Rx power alarm	192 to 195	dBm	–10.2	7.4

11 Mechanical Specifications

Figure 11-1 OSFP 800GE 2 x FR4 2km mechanical dimensions (Type 2 OSFP module)



12 Regulatory Compliance

Feature	Category	Standard	Performance
Safety	NRTL	UL 62368-1 CAN/CSA C22.2 No. 62368-1 IEC 60825-1:2014 IEC 60825-2	NRTL recognized component for US and CAN
	TUV	EN 62368-1 EN 60825-1:2014+A11:2021 EN 60825-2	TUV certificate
	FDA	U.S. 21 CFR 1040.10 & 1040.11, Notice 56	FDA/CDRH certified with accession number according to Laser Notice 56
Electromagnetic Compatibility	Radiated emissions	EN 55032 CISPR 32 ICES-003 VCCI-CISPR 32 AS/NZS CISPR 32	Class B digital device with a minimum –6 dB margin to the limit when tested with a metal enclosure. Final margin may vary depending on system application, good system EMI design practice, ie: suitable metal enclosure and well-bonding, is required to achieve Class B margins at the system level. Tested frequency range: 30 MHz to 40 GHz or 5th harmonic (5 times the highest

Feature	Category	Standard	Performance
			frequency), whichever is less.
	ESD	EN 55035 CISPR 35	Withstands discharges of ±8 kV contact, ±15 kV air.
	Radiated immunity	EN 55035 CISPR 35	Field strength of 10 V/m from 80 MHz to 6 GHz.
Restriction of Hazardous Substances	RoHS	EN IEC 63000:2018 & BS EN IEC 63000:2018	CE certificate

China RoHS hazardous substance table

产品满足中国 RoHS 的要求：

部件名称 **Part Descriptions**	**有害物质** **Hazardous Substances**					
	镉 **Cd**	**铅** **Pb**	**汞** **Hg**	**六价铬** **Cr (VI)**	**多溴联苯** **PBB**	**多溴二苯醚** **PBDE**
印制电路板组件 PCBA	○	×	○	○	○	○
金属部件 Metal Part	○	×	○	○	○	○
聚合物部件 Polymeric Part	○	○	○	○	○	○

备注：本表格依据 SJ/T 11364 的规定编制。

Remark: The table is prepared in accordance with SJ/T 11364.

○: 表示该有害物质在该部件所有均质材料中的含量均在 GB/T 26572 规定的限量要求以下。

It means that the content of the restricted substances in all materials of part is less than the limit defined in GB/T 26572 and other similar directives in other countries.

×: 表示该有害物质至少在该部件的某一均质材料中的含量超出 GB/T 26572 规定的限量要求。

It means that the content of the restricted substances in at least one homogenous material of part is not less than the limit defined in GB/T 26572 and other similar directives in other countries.

上表中的“╳”表示这些部件适用一项或多项欧盟 RoHS 豁免。

The "╳" in the above table indicates that one or more EU RoHS exemptions are applied in these parts.

13 ESD Design

Normal ESD precautions are required during the handling of this module. This transceiver is shipped in ESD protective packaging. It should be removed from the packaging and otherwise handled in an ESD protected environment utilizing standard grounded benches, floor mats, and wrist straps.

Parameter	Threshold Value	Note
ESD of high-speed pins	1 kV	Human body model
ESD of low-speed pins	2 kV	Human body model
Air discharge during operation	15 kV	-
Direct contact discharges to the case	8 kV	-

14 Safety Specification Design

⚠ CAUTION

Do not look into fiber end faces without eye protection using an optical meter (such as magnifier and microscope) within 100 mm, unless you ensure that the laser output is disabled. When operating an optical meter, observe the operation requirements.

CAUTION–Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

Attention–L'utilisation des commandes ou réglages ou l'exécution des procédures autres que celles spécifiées dans les présentes exigences peuvent être la cause d'une exposition à un rayonnement dangereux.

15 Ordering Information

Part Number	Description
1	OSFP 800GE 2 x FR4 2 km