Fiber Optic SFP 850 VCSEL OC-48 Lightwave Transceiver with DDMI

Data Sheet

OFD2400

The OFD2400 transceiver module operates at a wavelength of 850 nm and at 2.1 Gb/s for 1x/2x Fiber Channel and Gigabit Ethernet 1000BASE-SX applications.

Features

- Hot-pluggable
- Single +3.3 V supply
- Duplex LC interface
- 300 m link distance
- Internal Digital Diagnostics calibration
- Digital Diagnostics Monitoring for SFF-8472 compatible
- IEEE 802.3z Gigabit Ethernet 1000BASE-SX compliant
- EEPROM with Serial ID Functionality
- Fiber Channel (200-M5-SN-I, 100-M6-SN-I) compliant
- ESD Class 2 per MIL-STD 883D Method 3015.7
- FCC (Class B) and EN 55022 compliant
- Multi-Source Agreement (MSA) for Small Form Factor Pluggable (SFP) Compliant

Applications

- Telecommunications and Data Communications system networks
- Fiber-to-the-desktop
- Switches/bridges/routers/servers
- Local Area Networks
- Storage Area Networks
- High-speed computer links
- Switching system

Description

The OFD2400 transceiver provides signal conversion and processing for serial optical data communication applications. It operates over multimode fiber by converting lightwave information into an electrical signal and vice versa at a data rate of 2.1 Gb/s.

Housed in a compact metal package, the transceiver module consists of a transmitter and receiver optical subassembly coupled with a duplex LC receptacle. The module is designed especially for distances of up to 150 m with 62.5/125 µm multimode fibers.

This dual-fiber connector transceiver is designed for use in LAN, SAN, WAN, and Gigabit Ethernet 1000BASE-SX and 1x/2x Fiber Channel applications at 2.1 Gb/s.

Transceiver Monitoring Interface

OVD2400 provides an enhanced monitoring interface, which allows real-time access to device operating parameters such as transceiver temperature, laser bias current, transmitted optical power, received optical power and transceiver supply voltage. It also defines a sophisticated system of alarm and warning flags, which alerts end-users when particular operating parameters are outside of a normal factory-set range. The monitoring interface makes use of two wire address 1010001X (A2h) and is backward compatible with the Small Form Pluggable Multi-Source Agreement (SFP MSA).

Serial Identification (EEPROM)

An SFP having module definition 4 provides access to sophisticated identification information that describes the SFP transceiver's capabilities, standard interface, manufacturer and other information. An EEPROM containing the detailed product information and digital diagnostic function for the host equipment is accessed by the 2-wire serial CMOS EEPROM protocol. See SFP MSA for detailed description.

Safety

Laser Compliance Statement

The OFD2400 is classified as a Class I Laser Product. It complies with IEC 60825-1 and FDA 21 CFR 1040.10 and 1040.11. The transceiver must be operated under recommended operating conditions. Because the transceiver is designed to be inherently eye safe, it does not require open fiber control thus eliminating complex electronics or mechanics.

Caution – use of device other than those specified herein may result in hazardous laser radiation exposure or other damage. Please embrace all customary precautions and discretion while handling this device.

Performance Specifications

Absolute Maximum Ratings

Stresses in excess of the absolute maximum ratings can cause damage to the optical device. Operations of the optical device are suggested to remain within the recommended operating conditions. Exposure to the absolute maximum ratings for extended periods can adversely affect device reliability.

Parameter	Symbol	Minimum	Maximum	Unit
Storage Temperature	T_S	-40	+85	˚C
Operating Temperature	T_A	0	70	˚C
Power Supply Voltage	V_{CC}	-0.5	5.0	V
Differential Data Input Voltage			V_{CC} +0.5	V

Recommended Operating Conditions

Parameter	Symbol	Minimum	Typical	Maximum	Unit
Ambient Temperature	T_A	0		70	˚C
Power Supply Voltage	V_{CC}-V_{EE}	3.1	3.3	3.5	V
Transmitter					
Data Input Differential Voltage1	V_{DIFF}	0.4		1.6	V
TTL Transmit Disable Input Voltage – HIGH, LOW	V_{DSH} V_{DSL}	V_{CC}-1.3 0		V_{CC}+0.8	V

Input Data Rise/Fall, Time 10% - 90%	100	185	ps
Receiver			
Input Center Wavelength	770	860	nm

Notes:
1. **Data inputs are AC coupled with 100 O differential termination built into transceiver.**

Transmitter Electro-Optical Interface (T_A = 25°C)

Parameter	Symbol	Minimum	Typical	Maximum	Unit
Supply Voltage	V_{CC}	3.15	3.30	3.45	V
Launched Power (Average)[1]	P_O	-9.5		-2.5	dBm
Center Wavelength	λc	830	850	860	nm
Spectral Width (RMS)	Δλ			0.85	nm
Relative Intensity Noise	RIN			-117	dB/Hz
Extinction Ratio (Dynamic)	Er	9			dB
Optical Rise Time, 20% - 80%	t_R			150	ps
Optical Fall Time, 20% - 80%	t_F			150	
Input Differential Voltage Swing	V_{IN}	0.3		1.6	V
Transmitter Disable Voltage	V_{DIS}	V_{CC} – 1.3		V_{CC}	V
Transmitter Enable Voltage	V_{EN}	V_{ee}		V_{ee}+0.8	V
Supply Current	I_{TX}			130	mA

Notes:
1. **Into a multimode fiber, 50-µm core diameter.**

Receiver Electro-Optical Specifications (T_A = 25°C)

Parameter	Symbol	Minimum	Typical	Maximum	Unit
Supply Voltage	V_{CC}	3.15	3.30	3.45	V
Sensitivity (Average Power)[1]	P_{SEN}			-17	dBm
Saturation (Average Power)	P_{SAT}	0			dBm
Stressed Receive Sensitivity[2]	P_{STR}			-13.5	dBm
Operating Center Wavelength	λ_R	770		860	nm
Signal Loss Deassert Level[3]	P_{SLD}			-18	dBm
Signal Loss Assert Level[4]	P_{SLA}	-30			dBm
Signal Loss Hysteresis	$P_{SLD} - P_{SLA}$	0.5		5	dB
Differential Data Output Voltage Swing	V_{OUT}	0.4		1.6	ps
Output Data Rise/Fall Time, 20% - 80%	tr, tf			200	ps
Return Loss of Receiver	RL	12			dB
Supply Current[5]	I_{RX}		80		mA

Notes:
1. **Average optical power at which the BER is $1x10^{-12}$. Measured with a 2^7-1 NRZ PRBS and ER = 9 dB.**
2. **Measurement is made through a 50/125 µm multimode fiber.**
3. **Optical power above which the SIGNAL LOSS toggles from High to Low state.**
4. **Optical power below which the SIGNAL LOSS toggles from Low to High state.**
5. **Supply current including Rx outputs into a 50 Ω load.**

Timing Parameters[1]

	Symbol	Min	Max	Units	Condition
Tx Disable Assert Time	t_off		10	µs	Time from rising edge of Tx Disable to when the optical output falls below 10% of nominal
Tx Disable Negate Time	t_on		1	ms	Time from falling edge of Tx Disable to when the modulated optical output rises above 90% of nominal
Time to initialize, Including reset of Tx Fault	t_init		300	ms	From power on or negation of Tx Fault using Tx Disable
Tx Fault Assert Time	t_fault		100	µs	Time from fault to Tx fault on
Tx Disable to reset	t_reset	10		µs	Time Tx Disable must be held high to reset Tx Fault
LOS Assert Time	t_loss_on		100	µs	Time from LOS state to Rx LOS assert
LOS Deassert Time	t_loss_off		100	µs	Time from non-LOS state to Rx LOS deassert
Serial ID Clock Rate	f_serial_clock		100	kHz	

Note:
1. See SFP MultiSource Agreement (MSA) for detail descriptions of control and status timing requirements.

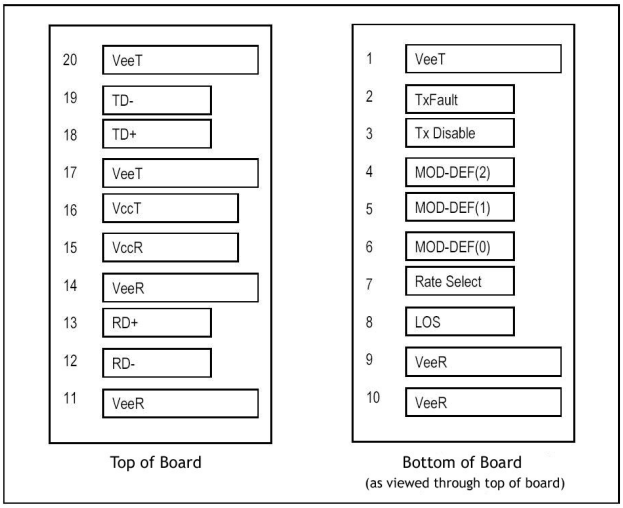
Laser Data

Wavelength	850 nm
Total output power (as defined by IEC: 50 mm aperture at 10 cm distance)	< 400 µW
Total output power (as defined by FDA: 7 mm aperture at 20 cm distance)	< 70 µW
Beam divergence	12°

Regulatory Compliance

Feature	Standard	Notes
Electrostatic Discharge (ESD) to the Electrical Pins	MIL-STD 883D Method 3015.7	Class 1 (> 1000V)
Immunity: Electrosatic Discharge (ESD) to the Duplex VF-45™ Receptacle	EN 61000-4-2 IEC 1000-4-2	Discharges of ±15kV with an air discharge probe on the receptacle cause no damage.
Immunity: Radio Frequency Electromagnetic Field	EN 61000-4-3 IEC 1000-4-3	With a field strength of 3V/m rms, noise frequency ranges from 10 MHz to 1 GHz. No effect on transceiver performance between the specification limits.
Emission: Electromagnetic Interference (EMI)	FCC Class B EN 55022 Class B CISPR 22	Noise frequency range: 30 MHz to 5 GHz

Pin Assignment



Pin Description and Plug-in Sequence[1] (1-Grd, 2-Power, 3-Signal)

Pin No.	Name	Description	Plug-in Sequence	Notes
1	VeeT	Transmitter Ground	1	
2	TX Fault	Transmitter Fault Indication	3	High indicates a laser fault of some kind. Low indicates normal operation.
3	TX Disable	Transmitter Disable	3	Transmitter disables on high or open.
4	MOD-DEF 2	Module Definition 2	3	2 wire serial ID interface
5	MOD-DEF 1	Module Definition 1	3	2 wire serial ID interface
6	MOD-DEF 0	Module Definition 0	3	Grounded in module
7	Rate Select	Bandwidth Selection	3	No implementation
8	LOS	Loss of Signal	3	High indicates the received optical power is below the worst-case receiver sensitivity. Low indicates normal operation. In low state, the output will be pulled to < 0.8V.
9	VeeR	Receiver Ground	1	
10	VeeR	Receiver Ground	1	
11	VeeR	Receiver Ground	1	
12	RD-	Inv. Received Data Out	3	AC coupled 100Ω differential lines which should be terminated with 100Ω (differential) at the user SERDES.
13	RD+	Received Data Out	3	
14	VeeR	Receiver Ground	1	
15	VccR	Receiver Power	2	3.3 V ± 5%
16	VccT	Transmitter Power	2	3.3 V ± 5%
17	VeeT	Transmitter Ground	1	
18	TD+	Transmit Data In	3	AC-coupled, differential lines

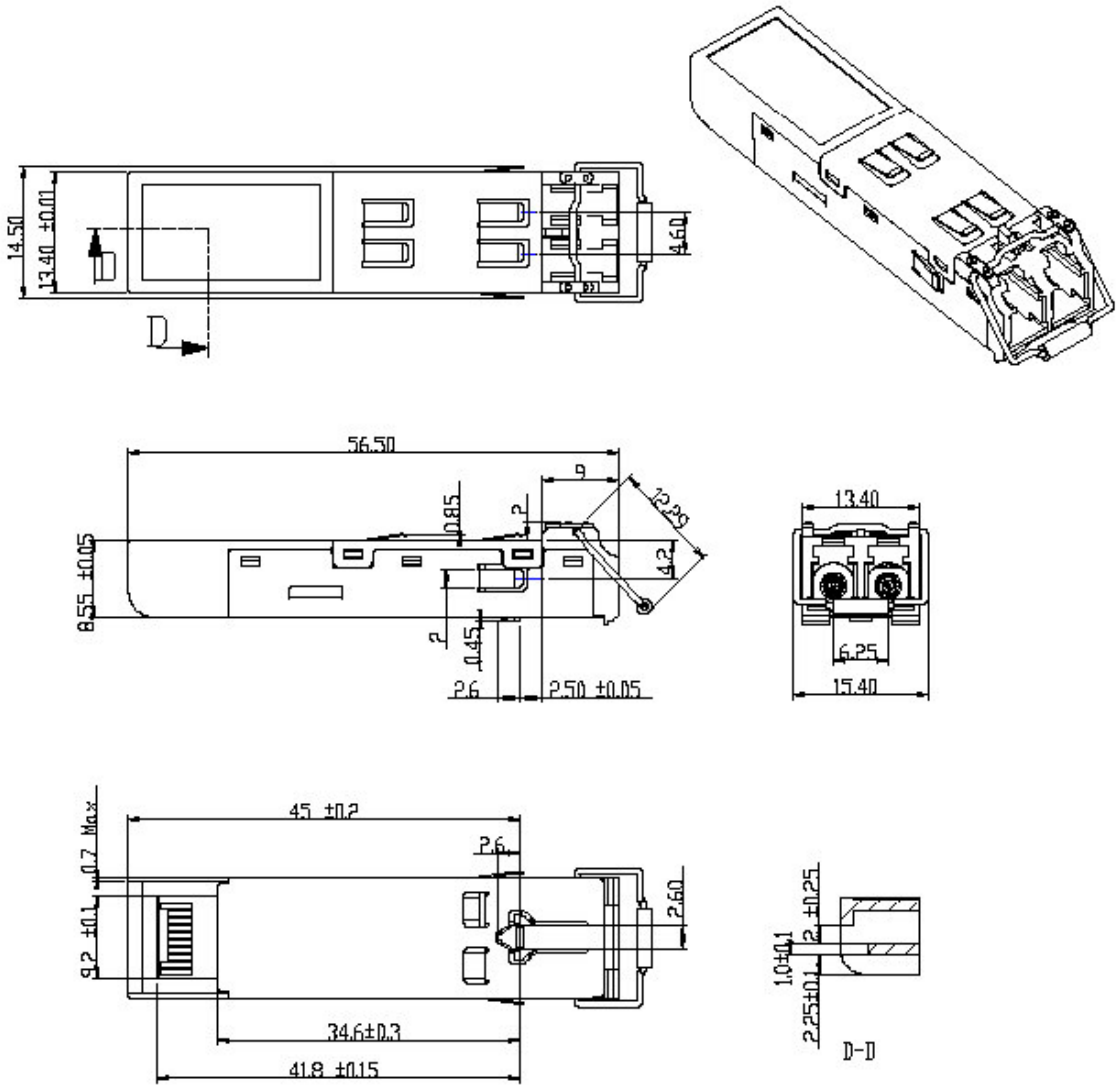
19	TD-	Inv. Transmit Data In	3	with 100Ω differential termination inside the module.
20	VeeT	Transmitter Ground	1	

Note:
1. Pin engagement sequence during hot plugging.

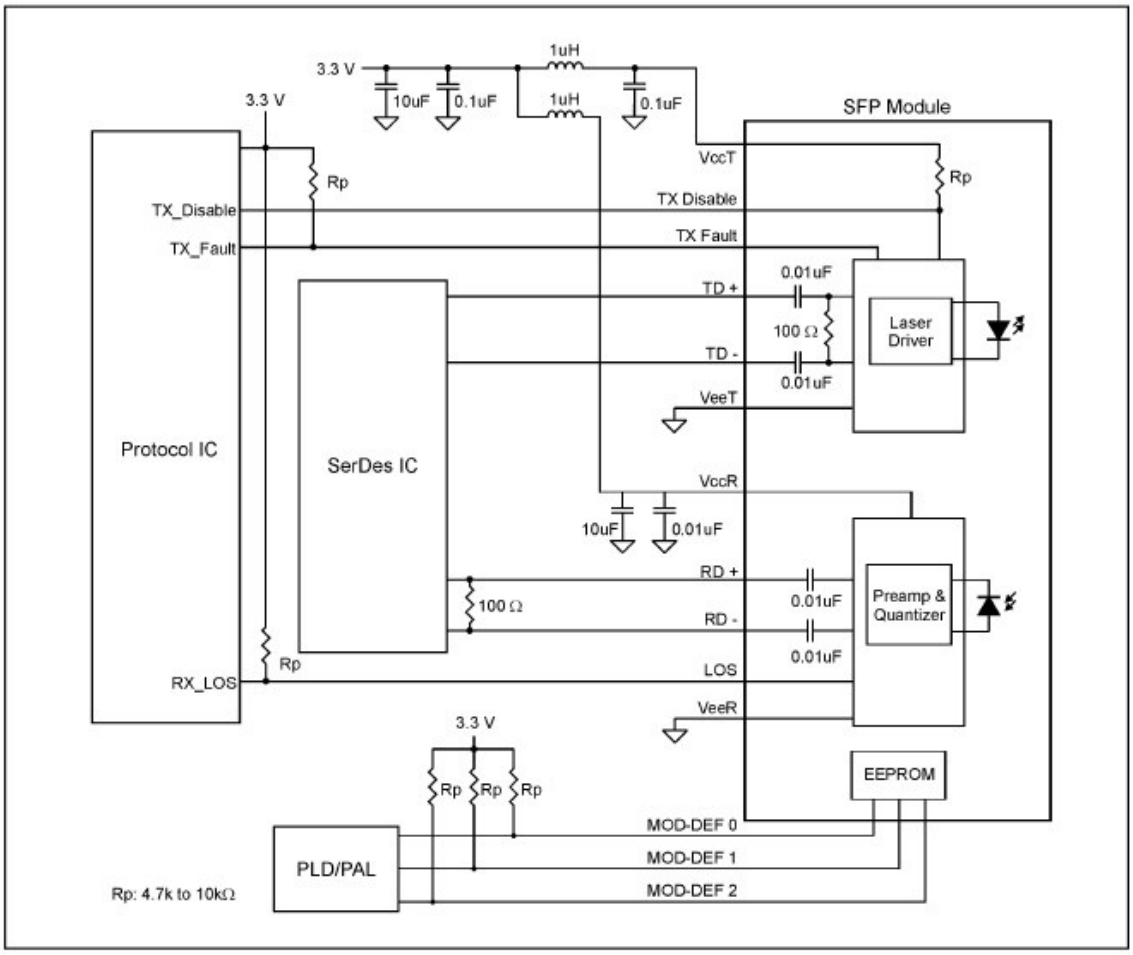
Physical Characteristics

Outline Diagram

Dimensions for the device package are given in millimeters.



Recommended Interface Diagram



Additional Information

Contact

For additional information, product specifications, or information about Optocom:

Internet: http://www.optocom.com
Email: sales@optocom.com
Tel: +1 978 988 8711
Fax: +1 978 988 8722