

OS-SP96-8503MD

MMF 850nm 10G SFP+ Transceiver Data Sheet

Features

- Operating Data Rate up to 10.31Gbps
- 850nm VCSEL Laser Transmitter
- 300m with 50/125 μ m MMF
- Single 3.3V Power Supply and TTL Logic Interface
- Hot-Pluggable SFP Footprint Duplex LC Connector Interface
- Power Dissipation < 1.0W
- Dispersion tolerance up to 40ps/nm over G.651
- Operating Temperature:
Standard: 0°C~+70°C
Industrial:-40°C~85°C
- Compliant with MSA SFP+ Specification SFF-8431
- Compliant with IEEE802.3ae 10GBASE-SR/SW
- Fully ROHS 2.0 compliant



Applications

- 10GASE-SW at 9.953Gbps
- 10GASE-SR at 10.3125Gbps
- OBSAI rates 6.144 Gb/s, 3.072 Gb/s, 1.536 Gb/s, 0.768Gb/s
- CPRI rates 10.138Gb/s , 9.830 Gb/s, 7.373Gb/s, 6.144 Gb/s, 4.915 Gb/s, 2.458 Gb/s, 1.229 Gb/s, 0.614Gb/s
- Other Optical Links

Absolute Maximum Ratings

Parameter	Symbol	Min.	Max.	Unit
Storage Temperature	TS	-40	+85	°C
Maximum Supply Voltage	VCC	-0.5	3.6	V
Operating Relative Humidity	RH		95	%

*Exceeding any one of these values may destroy the device immediately

Recommended Operating Conditions

Parameter	Symbol	Min.	Typ.	Max.	Unit
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Operating Case Temperature	Tc	OS-SP96-8503MD	0		70	°C
	Tc	OS-SP96-8503MDI	-40		85	°C
Power Supply Voltage	Vcc		3.15	3.3	3.45	V
Power Supply Current	Icc				300	mA
Surge Current	I _{surge}				+30	mA
Baud Rate	10GBASE-SR			10.31		Gbps
	10GBASE-SW			9.95		

Performance Specifications – Electrical

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Transmitter						
LVPECL Inputs(Differential)	V _{in}	150		1200	mVpp	AC Coupled Inputs*(Note1)
Input AC Common Mode Voltage		0		25	mV	RMS
Input Impedance (Differential)	Z _{in}	85	100	115	ohms	R _{in} > 100 kohms @ DC
Differential Input S-parameter	SDD11	-	-	-10	dB	
Differential to Common Mode Conversion	SCD11	-	-	-10	dB	
TX_DIS	High	2		V _{cc}	V	
	Low	0		0.8		
TX_FAULT	High	2		V _{cc} +0.3	V	I _o =400uA ,host V _{cc}
	Low	0		0.8		I _o =-4.0mA
Receiver						
CML Outputs (Differential)	V _{out}	350		700	mVpp	AC Coupled Outputs*(Note1)
Output AC Common Mode Voltage		0		15	mV	
Output Impedance(Differential)	Z _{out}	85	100	115	ohms	
Differential Output S-parameter	SD22	-	-	-10	dB	
RX_LOS	LOS	VoH	2	V _{cc} +0.3		
	Normal	VoL	0	0.8		
MOD_DEF(0.2)		VoH	2		V	With Serial ID
		VoL	0	0.5		

Note1: LVPECL logic, internally AC coupled

Optical and Electrical Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit
50μm Core Diameter MMF	L		300		m
Data Rate		0.6	10.31		Gbps
Transmitter					
Center Wavelength	λ _C	840	850	860	nm
Spectral Width (RMS)	Δλ			0.45	nm
Average Output Power*(Note2)	P _{out}	-6		-1	dBm

Extinction Ratio	ER	3			dB
TX_Disable Assert Time	t_off			10	us
TX_DISABLE Negate Time	t_on			1	ms
Transmitter Dispersion Penalty	TDP			3.9	dB
Output Optical Eye	IEEE 802.3-2005 Compliant				
Input Differential Impedance	ZIN	85	100	115	Ω
TX_Disable Assert Time	T_off			10	us
TX_DISABLE Negate Time	T_on			1	ms
TX_BISABLE time to start reset	t_reset	10			us
TX_FAULT from fault to assertion	t_init			300	ms
Total Jitter	t_fault			100	us
Data Dependant Jitter	TJ			0.28	UI(p-p)
Uncorrelated Jitter	DDJ			0.1	UI(p-p)
Uncorrelated Jitter	UJ			0.023	RMS
Receiver					
Center Wavelength	λC	840	850	860	nm
Receiver Sensitivity	Pmin			-11.1	dBm
Output Differential Impedance	Rin	85	100	115	Ω
Receiver Overload*(Note3)	Pmax	-1			dBm
Return Loss	ORL			-12	dB
LOS De-Assert	LOSD			-12.5	dBm
LOS Assert	LOSA	-25			dBm
LOS-Hysteresis	Phys	0.5			dB

Note2: Output is coupled into a 9/125um SMF. The -4.7dBm is reference IEEE 802.3ae, the typical value is -1dBm.

Note3: Minimum average optical power measured at the BER less than 1E-12, back to back. The measure pattern is PRBS 231-1.

Regulatory Compliance

Feature	Standard	Performance
Electrostatic Discharge (ESD) to the Electrical Pins	MIL-STD-883G Method 3015.7	Class 1C (>1000V)
Electrostatic Discharge to the enclosure	EN 55024:2010+A1:2015 IEC-61000-4-2 GR-1089-CORE	Compliant with standards
Electromagnetic Interference (EMI)	FCC 47CFR Part 15 Class B EN55032:2015 CISPR 22B :2006 VCCI Class B	Compliant with standards Noise frequency range: 0.15MHz to 6GHz. Good system EMI design practice required to achieve Class B margins. System margins are dependent on customer host board and chassis design.
Immunity	EN 55024:1998+A1+A2 IEC 61000-4-3	Compliant with standards. 1KHz sine-wave, 80% AM, from 80MHz to 1GHz. No effect on transmitter/receiver performance is detectable between these limits.
Component Recognition	UL and CUL EN60950-1:2006	UL file E317337 TÜV Certificate No. 50135086(CB scheme)

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RoHS6	2002/95/EC 4.1&4.2 5&7&13	2005/747/EC	Compliant with standards*(Note4)
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Note4: For update of the equipments and strict control of raw materials, OUSENT has the ability to supply the customized products since Jan 1, 2007, which meet the requirements of RoHS6 (Restrictions on use of certain Hazardous Substances) of European Union. In light of item 5 in RoHS exemption list of RoHS Directive 2002/95/EC, Item 5: Lead in glass of cathode ray tubes, electronic components and fluorescent tubes. In light of item 13 in RoHS exemption list of RoHS Directive 2005/747/EC, Item13: Lead and cadmium in optical and filter glass. The three exemptions are being concerned for Ousent's transceivers, because Ousent's transceivers use glass, which may contain Pb, for components such as lenses, windows, isolators, and other electronic components.

Laser Safety:

All transceivers are Class 1 Laser products per FDA/CDRH and IEC-60825 standards. They must be operated under specified operating conditions

Ousent Technologies Co., Ltd

NAME OF MANUFACTURE:

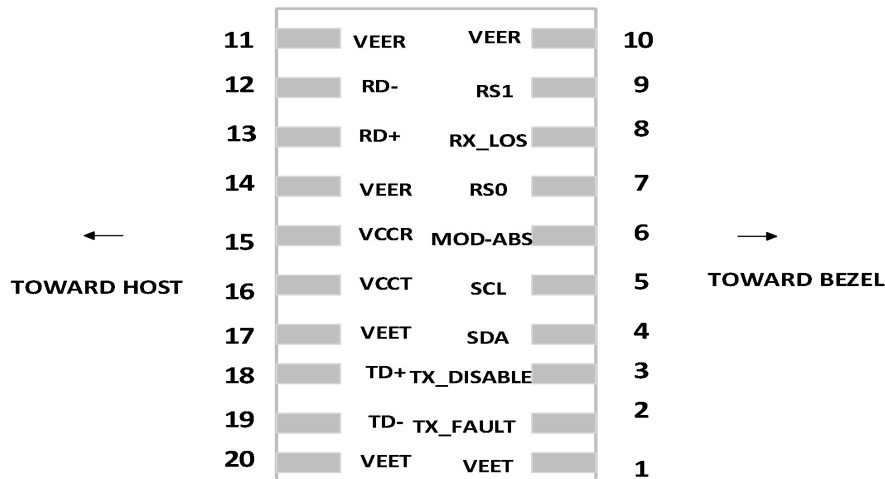
This product complies with
21 CFR 1040. 10 and 1040. 11
Meet Class 1 Laser Safety Requirements



Type Approved
Safety
Regular Production
Surveillance
www.tuv.com
ID 2000000000



Electrical Pin-out Details



Pin Function Definitions

Pin	Name	Function	Plug Seq.	Notes
1	VeeT	Transmitter Ground	1	5)
2	TX Fault	Transmitter Fault Indication	3	1)
3	TX Disable	Transmitter Disable	3	2) Module disables on high or open
4	SDA	Transmitter Disable	3	3) 2 wire serial ID interface.
5	SCL	Module Definition 2	3	3) 2 wire serial ID interface.
6	MOD-ABS	Module Definition 1	3	3)
7	RS0	RX Rate Select(LVTTL).	3	Rate Select 0, optionally controls SFP+module receiver. This pin is pulled low to VeeT with a >30K resistor..
8	LOS	Loss of Signal	3	4)
9	RS1	TX Rate	1	Rate Select 1, optionally controls SFP+Module transmitter. This pin is pulled

		Select(LVTTL).		low toVeeT with a >30K resistor.
10	VeeR	Receiver Ground	1	5)
11	VeeR	Receiver Ground	1	5)
12	RD-	Inv. Received Data Out	3	6)
13	RD+	Received Data Out	3	6)
14	VeeR	Receiver Ground	1	5)
15	VccR	Receiver Power	2	7) 3.3V ± 5%
16	VccT	Transmitter Power	2	7) 3.3V ± 5%
17	VeeT	Transmitter Ground	1	5)
18	TD+	Transmit Data In	3	8)
19	TD-	Inv. Transmit Data In	3	8)
20	VeeT	Transmitter Ground	1	5)

NOTES:

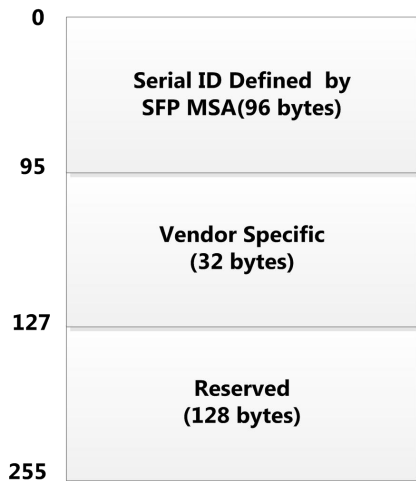
- 1) TX Fault is an open collector/drain output, which should be pulled up with a 4.7K-10K resistor on the host board. Pull up voltage between 2.0V and VccT, R+0.3V. When high, output indicates a laser fault of some kind. Low indicates normal operation. In the low state, the output will be pulled to < 0.8V.
- 2) TX disable is an input that is used to shut down the transmitter optical output. It is pulled up within the module with a 4.7-10 K resistor. It states are Low(0-0.8V): Transmitter on.(>0.8, < 2.0V): UndefinedHigh (2.0 – 3.465V): Transmitter Disabled Open: Transmitter Disabled
- 3) Modulation Absent, connected to VEET or VEER in the module
- 4) LOS (Loss of Signal) is an open collector/drain output, which should be pulled up with a 4.7K 10K resistor. Pull up voltage between 2.0V and VccT, R+0.3V. When high, this output indicates the received optical power is below the worst-case receiver Sensitivity (as defined by the Standard in use). Low indicates normal operation. In the low state, the output will be pulled to <0.8V.
- 5) VeeR and VeeT may be internally connected within the SFP module.
- 6) RD-/+ : These are the differential receiver outputs. They are AC coupled 100 differential Lines which should be terminated with 100 (differential) at the user SERDES. The AC coupling is done inside the module and is thus not required on the host board. The voltage swing on these lines will be between 400 and 2000 mV differential (200 –1000 mV single ended) when properly terminated.
- 7) VccR and VccT are the receiver and transmitter power supplies. They are defined as 3.3V±5% at the SFP connector pin. Maximum supply current is 300mA. Recommended host board power supply filtering is shown below. Inductors with DC resistance of less than 1 ohm should be used in order to maintain the required voltage at the SFP input pin with 3.3V supply voltage. When the recommended supply-filtering network is used, hot plugging of the SFP transceiver module will result in an inrush current of no more than 30mA greater than the steady state value. VccR and VccT may be internally connected within the SFP transceiver module.
- 8) TD-/+ : These are the differential transmitter inputs. They are AC-coupled, differential lines with 100 differential termination inside the module.

EEPROM

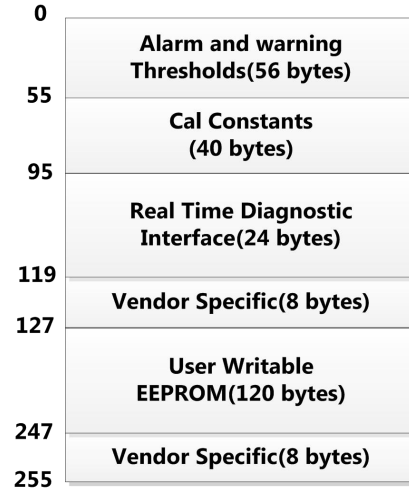
The serial interface uses the 2-wire serial CMOS EEPROM protocol defined for the ATMEL AT24C02/04 family of components. When the serial protocol is activated, the host generates the serial clock signal (SCL). The positive edge clocks data into those segments of the EEPROM that are not write protected within the SFP+ transceiver. The negative edge clocks data from the SFP+ transceiver. The serial data signal (SDA) is Bi-directional for serial data transfer. The host uses SDA in conjunction with SCL to mark the start and end of serial protocol activation. The memories are organized as a series of 8-bit data words that can be addressed individually or sequentially.

The Module provides diagnostic information about the present operating conditions. The transceiver generates this diagnostic data by digitization of internal analog signals. Calibration and alarm/warning threshold data is written during device manufacture. Received power monitoring, transmitted power monitoring, bias current monitoring, supply voltage monitoring and temperature monitoring all are implemented. If the module is defined as external calibrated, the diagnostic data are raw A/D values and must be converted to real world units using calibration constants stored in EEPROM locations 56 – 95 at wire serial bus address A2h. The digital diagnostic memory map specific data field define as following. For detail EEPROM information please refer to the related document of SFF8472 Rev 10.2.

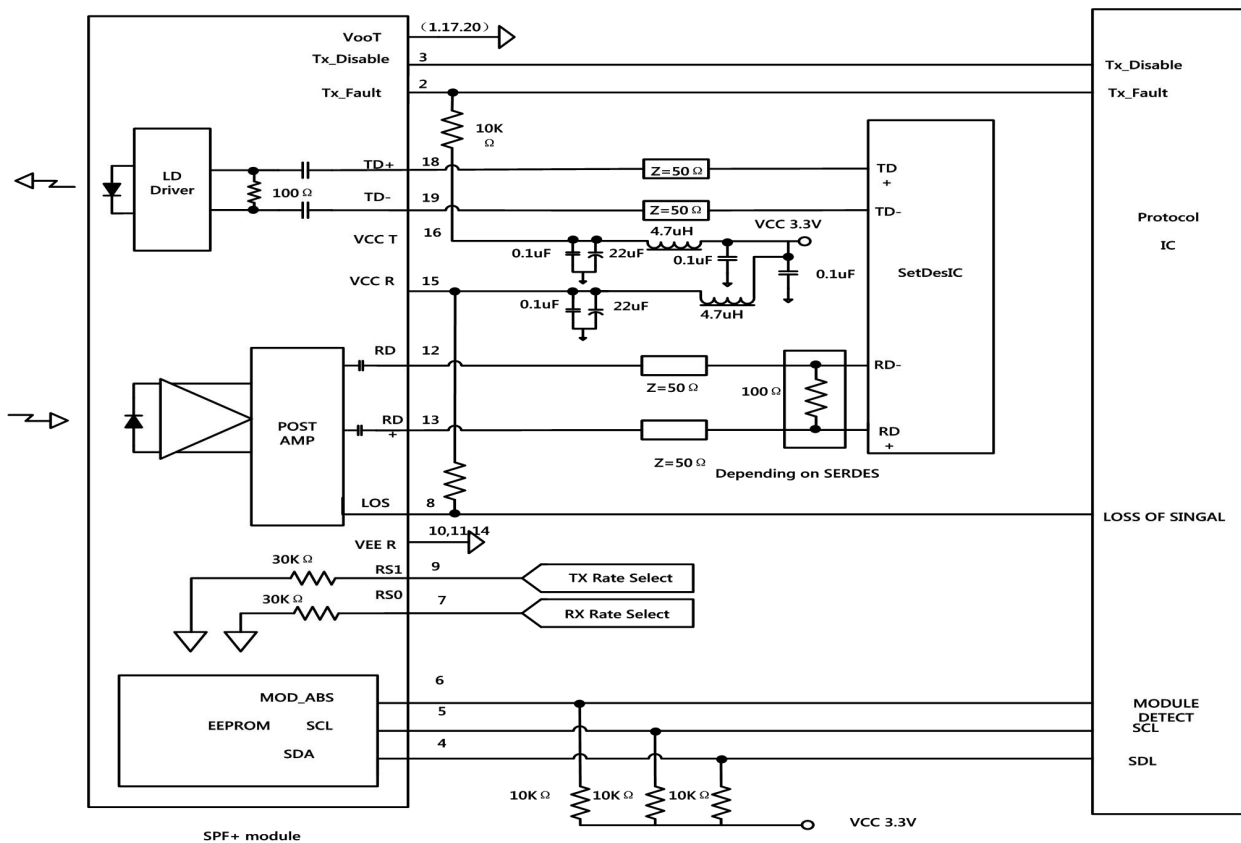
2 wire address 1010000X(A0h)



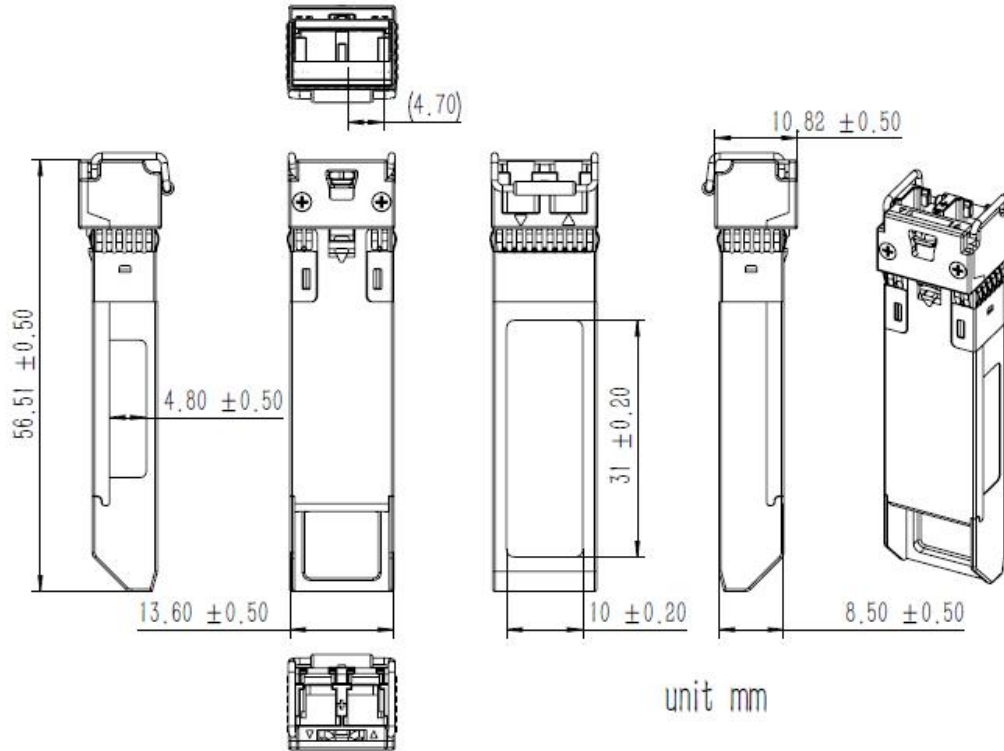
2 wire address 1010000X (A2h)



Recommend Circuit Schematic



Mechanical Specifications



Order Information

Part No.	Data Rate	Fiber	Distance	Interface	Temp.	DDMI
OS-SP96-8503MD	10.31Gbps	MMF	300m	LC	0~70°C	Yes
OS-SP96-8503MDI	10.31Gbps	MMF	300m	LC	-40~85°C	Yes

Notice:

Ousent reserves the right to make changes to or discontinue any optical link product or service identified in this publication without notice in order to improve design and or performance.

Applications that are described herein for any of the optical link products are for illustrative purposes only. Ousent makes no representation or warranty that such applications will be suitable for the specified use without further testing or modification.

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