

10G SFP+ Active Optical Cable

ESAOC002

Product Features

- Support Rate 10.3125Gbps
- 850nm VCSEL TX
- 850nm PIN RX
- SFI electrical interface
- 2-wire interface for integrated Digital Diagnostic monitoring
- SFP+ MSA package
- Hot pluggable
- Low EMI and excellent ESD protection
- +3.3V power supply
- Power consumption less than 1W
- Operating range 0~70°C case temperature
- Distance 1m, 3m, 5m, 7m, 10m, 15m, 30m, 50m, 100m

Absolute Maximum Ratings

Parameter	Symbol	Min.	Max.	Unit
Storage temperature	T _s	-40	+85	°C
Supply voltage	V _{CC3}	0	3.6	V
Relative humidity	RH	5	85	%

Recommended Operating Conditions

Parameter	Symbol	Min.	Typ.	Max.	Unit
Operating case temperature	T _c	0		+70	°C
Power supply voltage	V _{CC3}	3.135	3.3	3.465	V
	I _{CC3}			300	mA
Power dissipation	P _D			1	W

Data rate			10.3125		Gbps
Transmission distance		0.5	1,3,5,7,10,15	100	m

Transmitter Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Input differential impedance	R _{in}		100		Ω	1
Tx input diff swing	V _{in,pp}	180		700	mV	
Tx_disable, disable	V _D	2		VCC	V	
Tx_disable, enable	V _{EN}	VEE		VEE+0.8	V	

Receiver Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Differential data output swing	V _{out,pp}	300		850	mV	2
Data output rise time fall time	t _r			28	Ps	3
LOS fault	V _{LOS fault}	2		V _{CCHOST}	v	4
LOS normal	V _{LOS norm}	Vee		Vee+08	v	4
Power supply noise tolerance	V _{ccT/VccR}	per SFF-8431 Rev.4.1			mVpp	5

Note:

- connected directly to TX data input pins. AC coupling from pins into laser driver IC.
- Into 100Ω differential termination.
- 20~80%, measured with module compliance test board and OMA test pattern. Use of four 1's and hour 0's in sequence in the PRBS⁹ is an acceptable alternative.
- LOS is an open collector output. Should be pulled up with 4.7kΩ~10kΩ on the host board. Normal operation is logic 0; loss of signal is logic 1. Maximum pull-up voltage is 5.5V.
- Testing methodology per 1.

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Bit rate	BR		10.3125		Gb/s	
Bit error ratio	BER			10 ⁻¹²		

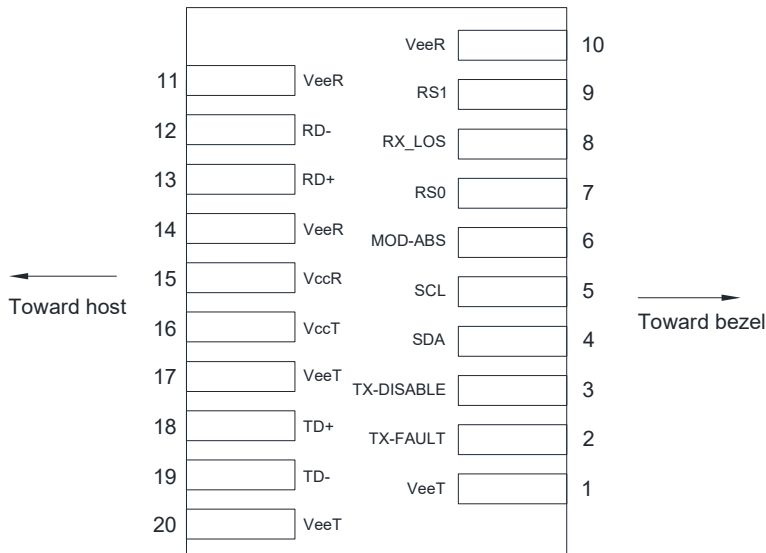
Control and Status I/O Timing Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
TX disable assert time	t_off			100	μs	1
TX disable negate time	t_on			2	ms	2
Time to initialize including reset of TX_fault	t_init			300	ms	3
TX fault assert time	t_fault			1	ms	4
Tx_fault reset	t_reset	10			μs	5
LOS assert time	t_loss_on			100	μs	6
LOS deassert time	t_loss_off			100	μs	7
Serial ID clock rate	f_serial_clock	100		400	kHz	8

Note:

1. Time from rising edge of TX disable to when the optical output falls below 10% nominal
2. Time from falling edge of TX disable to when the modulated optical output rises above 90% of nominal
3. From power on or negation of TX fault using TX disable
4. Time from fault to TX fault on
5. Time TX disable must be held high to reset TX_fault
6. Time from LOS state to RX LOS assert
7. Time from non-LOS state to RX LOS deassert
8. Time from rising or falling edge of Rate Select input until receiver bandwidth is in conformance with appropriate specification.

Pin Descriptions

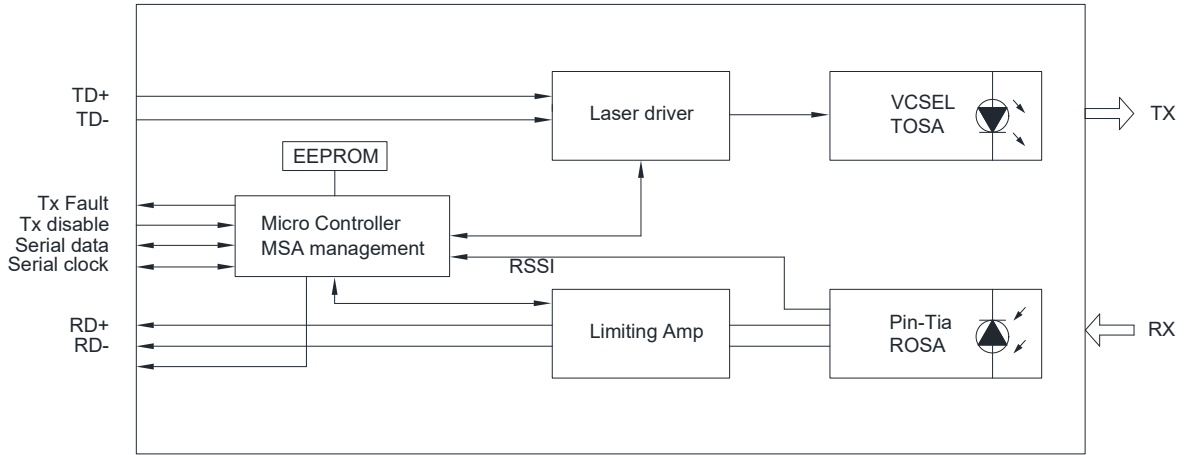


Pin	Symbol	Descriptions	Note
1	VeeT	Module transmitter ground	1
2	TX_fault	Module transmitter fault	2
3	TX_disable	Transmitter disable; turns off transmitter laser output	3
4	SDA	2-wire serial interface data line (same as MOD-DEF2 as defined in INF-8074i)	4
5	SCL	2-wire serial interface clock (same as MOD-DEF1 as defined in INF-8074i)	4
6	MOD_ABS	Module absent, connected to VeeT or VeeR in the module	5
7	RS0	Rate select 0, optionally controls SFP+ module receiver, when high input data rate 10.3GBd and when low input data rate 1.25GBd	6
8	RX_LOS	Receiver loss of signal indication (in FC designated as RX_LOS, in SONET designated as LOS, and in Ethernet designated as signal detect)	2
9	RS1	Rate select 1, optionally controls SFP+ module transmitter, when high input data rate 10.3GBd and when low input data rate 1.25GBd	1
10	VeeR	Module receiver ground	1
11	VeeR	Module receiver ground	1
12	RD-	Receiver inverted data output	
13	RD+	Receiver non-inverted data output	
14	VeeR	Module receiver ground	1
15	VccR	Module receiver 3.3V supply	
16	VccT	Module transmitter 3.3V supply	
17	VeeT	Module transmitter ground	1
18	TD+	Transmitter non-inverted data input	
19	TD-	Transmitter inverted data input	
20	VeeT	Module transmitter ground	1

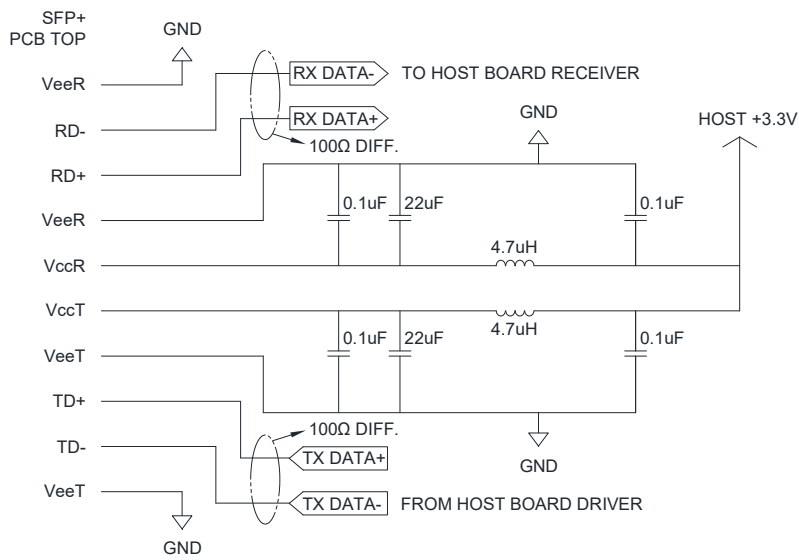
Note:

1. The module signal ground pins, VeeR and VeeT, shall be isolated from the module case.
2. This pin is an open collect/drain output pin and shall be pulled up with 4.7k-10kohms to Host_Vcc on the host board. Pull ups can be connected to multiple power supplies. However the host board design shall ensure that no module pin has voltage exceeding module VccT/R + 0.5V
3. This pin is an open collect/drain input pin and shall be pulled up with 4.7k-10kohms to VccT in the module
4. See SFF-8472 4.2 2-wire electrical specification
5. This pin shall be pulled up with 4.7k-10kohms to Host_Vcc on the host board
6. If implementing, SFF-8079 pin 7 and 9 are used for AS0.

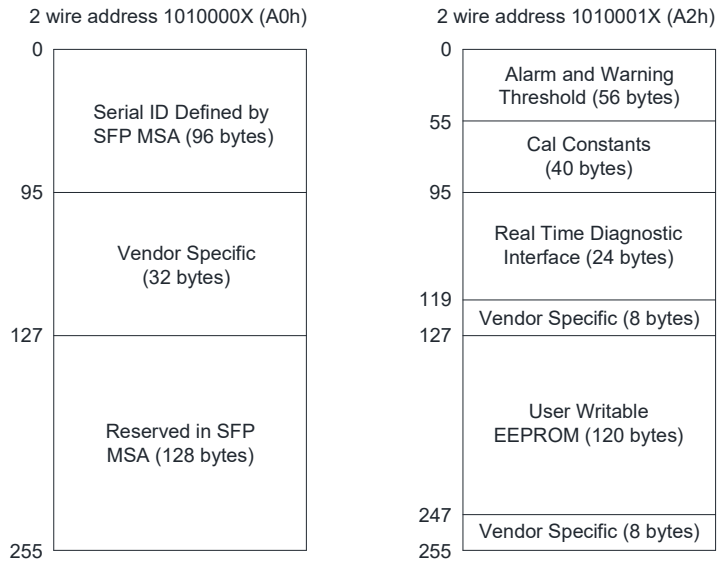
Block diagram of transceiver



Recommended interface circuit



Digital Diagnostic Memory Map



Cable details

Parameter	Min.	Typ.	Max.	Unit
Jacket Material	PVC			
Jacket Color	orange			
Flammability Rating	OFNR			
Outer Diameter	2.8	3.0	3.2	mm
Tensile Load (Short Term)			200	N
Tensile Load (Long Term)			100	N
Crush Resistance	10			N/mm
Impact Resistance	0.5			N·m
Flexing	300			cycles
Twist Bend				
Cable to SFP+ Plug Connection			90	newtons
Bend Radius (Short Term)	25			mm
Bend Radius (Long Term)	30			mm
Durability	100			cycle min.