

This 850 nm VCSEL 10 Gb SFP+ transceiver transmits and receives optical data over 50/125 μm or 62.5/125 μm multimode fibers via two LC connectors. The electrical interface complies with SFI specs, featuring 100 Ohm differential impedance and AC-coupled data lines, minimizing EMI. It typically operates over 200 mm of improved FR4 or up to 150 mm of standard FR4 with one connector.

The transmitter converts 10 Gbit/s PECL or CML electrical data into optical data per 10GBASE-SR standards, with an APC loop for stable output. The Transmit Disable (TX_Dis) input disables the laser when logic "1" or open and needs a 4.7–10 k Ω resistor. The Transmit Fault (TX_Fault) output signals faults and also requires a pull-up resistor.

The receiver converts 10 Gbit/s optical data into PECL/CML electrical data. The Loss of Signal (Rx_LOS) output signals weak optical levels and needs a pull-up resistor or active termination. Power supply filtering is advised for both transmitter and receiver to maintain signal integrity. Rx_LOS can warn of cable issues or remote transmitter problems.

FEATURES AND BENEFITS

- Optical interface compliant to IEEE 802.3ae 10GBASE-SR
- Compliance: MSA SFF-8431, RoHS
- Hot Pluggable
- 850nm VCSEL transmitter, PIN photo-detector
- Maximum link length of 300m on 2000MHz/km MMF
- Operating case temperature: 0 to 70°C
- Low power consumption
- All-metal housing for superior EMI performance
- Advanced firmware allow customer system encryption information to be stored in transceiver
- Cost effective SFP+ solution, enables higher port densities and greater bandwidth



APPLICATIONS

- 10GBASE-SR at 10.3125Gbps
- 10GBASE-SW at 9.953Gbps
- Other optical links

GENERAL SPECIFICATIONS

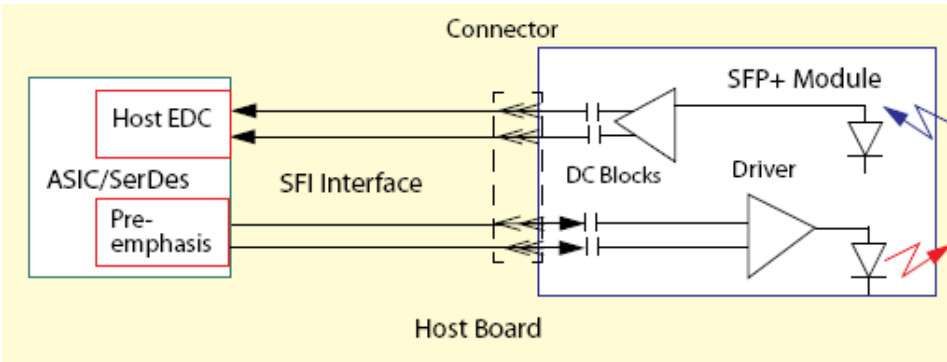
ITEM	DETAIL
Interface Type	10G
Fiber Type	Multimode
Transceiver Format	SFP
Wavelength	850nm
Tx Distance	300 m
Connectors	LC
Cable Type	Duplex 50/125 μm multimode

OPERATING RANGE BY FIBER TYPE

FIBER TYPE	MINIMUM MODAL BANDWIDTH AT 850NM (MHZ*KM)	OPERATING RANGE (METERS)
62.5 μm MMF	160	2 - 26
	200	2 - 33
50 μm MMF	400	2 - 66
	500	2 - 82
	2000	2 - 300

PART NUMBER	DESCRIPTION
SSF-SFP-MM10G	10G SFP+ transceiver MM 10GBase-SR, 850nm, 300m max reach

INTERFACE TO HOST



PIN DEFINITION

The SFP+ modules are hot-pluggable. Hot pluggable refers to plugging in or unplugging a module while the host board is powered. The SFP+ host connector is a 0.8 mm pitch 20 position right angle improved connector specified by SFF-8083, or stacked connector with equivalent with equivalent electrical performance. Host PCB contact assignment is shown in Figure 2 and contact definitions are given in Table 2. SFP+ module contacts mates with the host in the order of ground, power, followed by signal as illustrated by Figure 3 and the contact sequence order listed in Table 2.

Figure 2: Interface to Host PCB

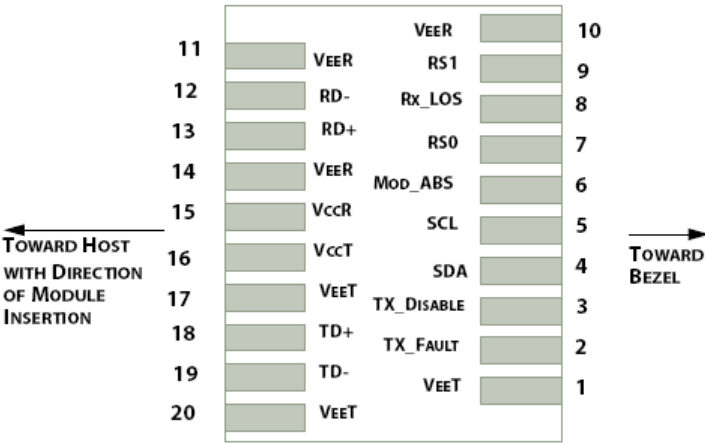
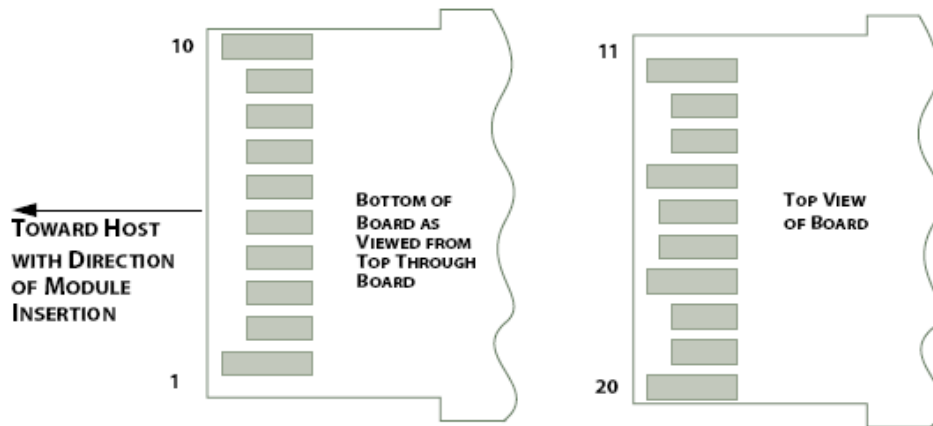


Figure 3: Module Contact Assignment



PIN DEFINITION

CONTACTS	LOGIC	SYMBOL	POWER SEQUENCE ORDER	DESCRIPTION
1		VeeT	1st	Module Transmitter Ground
2	LVTTL-O	TX_Fault	3rd	Module Transmitter Fault
3	LVTTL-I	TX_Disable	3rd	Transmitter Disable; Turns off transmitter laser output
4	LVTTL-I/O	SDA	3rd	2-wire Serial Interface Data Line (Same as MOD-DEF2 in the INF-8074i)
5	LVTTL-I/O	SCL	3rd	2-wire Serial Interface Clock (Same as MOD-DEF1 in the INF-8074i)
6		Mod_ABS	3rd	Module Absent, connected to VeeT or VeeR in the module
7	LVTTL-I	RS0	3rd	Rate Select 0, optionally controls SFP+ module receiver. When high input signaling rate > 4.25 GBd and when low input signaling rate ≤ 4.25 GBd
8	LVTTL-O	Rx_LOS	3rd	Receiver Loss of Signal Indications (In FC designated as RX_LOS and in Ethernet designated as Signal Detect)
9	LVTTL-I	RS1	3rd	Rate Select 1, optionally controls SFP+ transmitter . When high input signaling rate > 4.25 GBd and when low input signaling rate ≤ 4.2 5 GBd
10		VeeR	1st	Module Receiver Ground
11		VeeR	1st	Module Receiver Ground
12	CML-O	RD-	3rd	Receiver Inverted Data Output
13	CML-O	RD+	3rd	Receiver Non-Inverted Data Output
14		VeeR	1st	Module Receiver Ground
15		VccR	2nd	Module Receiver 3.3 V Supply
16		VccT	2nd	Module Transmitter 3.3 V Supply
17		VeeT	1st	Module Transmitter Ground
18	CML-I	TD+	3rd	Transmitter Non-Inverted Data Input
19	CML-I	TD-	3rd	Transmitter Inverted Data Input
20		VeeT	1st	Module Transmitter Ground

ABSOLUTE MAXIMUM RATINGS

These values represent the damage threshold of the module. Stress in excess of any of the individual Absolute Maximum Ratings can cause immediate catastrophic damage to the module even if all other parameters are within Recommended Operating Conditions.

Table 1 - Absolute Maximum Ratings

PARAMETER	SYMBOL	MIN	MAX	UNIT
Power Supply Voltage	VCC	0	+3.6	V
Storage Temperature	T _c	-40	+85	°C
Operating Case Temperature	T _c	-5	+75	°C
Relative Humidity	RH	5	95	%
RX Input Average Power	P _{max}	-	0	dBm

RECOMMENDED OPERATING CONDITIONS

Recommended Operating Environment specifies parameters for which the electrical and optical characteristics hold unless otherwise noted.

Table 2 - Recommended Operating Conditions

PARAMETER	SYMBOL	MIN	TYPICAL	MAX	UNIT
Power Supply Voltage	VCC	3.135	3.300	3.465	V
Operating Case Temperature	T _c	0	25	70	°C

Optical and Electrical Characteristics

The following optical characteristics are defined over the Recommended Operating Environment unless otherwise specified.

PARAMETER	SYMBOL	MIN	TYPICAL	MAX	UNIT	NOTES
TRANSMITTER						
Center Wavelength	λ_t	840	850	860	nm	
RMS spectral width	Pm	-	-	Note 1	nm	
Average Optical Power	Pavg	-6.5	-	-1	dBm	2
Extinction Ratio	ER	3.5	-	-	dB	3
Transmitter Dispersion Penalty	TDP	-	-	3.9	dB	
Relative Intensity Noise	Rin	-	-	-128	dB/Hz	12dB reflection
Optical Return Loss Tolerance	-	-	12	dB		
RECEIVER						
Center Wavelength	λ_r	840	850	860	nm	
Receiver Sensitivity	Psens	-	-	-11.1	dBm	4
Stressed Sensitivity in OMA	-	-	-7.5	dBm	4	3
Los function	Los	-30	-	-12	dBm	
Overload	Pin	-	-	-1.0	dBm	4
Receiver Reflectance	-	-	-12	dB		

Notes:

1. Trade-offs are available between spectral width, center wavelength and minimum OMA..
2. The optical power is launched into MMF
3. Measured with a PRBS 231-1 test pattern @10.3125Gbps
4. Measured with a PRBS 231-1 test pattern @10.3125Gbps, BER \leq 10⁻¹².

OPTICAL CHARACTERISTICS (MINIMUM 10GBASE-SR OMA AS A FUNCTION OF WAVELENGTH AND SPECTRAL WIDTH)

CENTER WAVELENGTH (NM)	RMS SPECTRAL WIDTH (NM)								
	UP TO 0.05	0.05 TO 0.1	0.1 TO 0.15	0.15 TO 0.2	0.2 TO 0.25	0.25 TO 0.3	0.3 TO 0.35	0.35 TO 0.4	0.4 TO 0.45
840 to 842	-4.2	-4.2	-4.1	-4.1	-3.9	-3.8	-3.5	-3.2	-2.8
842 to 844	-4.2	-4.2	-4.2	-4.1	-3.9	-3.8	-3.6	-3.3	-2.9
844 to 846	-4.2	-4.2	-4.2	-4.1	-4.0	-3.8	-3.6	-3.3	-2.9
846 to 848	-4.3	-4.2	-4.2	-4.1	-4.0	-3.8	-3.6	-3.3	-2.9
848 to 850	-4.3	-4.2	-4.2	-4.1	-4.0	-3.8	-3.6	-3.3	-3.0
850 to 852	-4.3	-4.2	-4.2	-4.1	-4.0	-3.8	-3.6	-3.4	-3.0
852 to 854	-4.3	-4.2	-4.2	-4.1	-4.0	-3.9	-3.7	-3.4	-3.1
854 to 856	-4.3	-4.3	-4.2	-4.1	-4.0	-3.9	-3.7	-3.4	-3.1
856 to 858	-4.3	-4.3	-4.2	-4.1	-4.0	-3.9	-3.7	-3.5	-3.1
858 to 860	-4.3	-4.3	-4.2	-4.2	-4.1	-3.9	-3.7	-3.5	-3.2

Digital Diagnostic Functions

The following digital diagnostic characteristics are defined over the Recommended Operating Environment unless otherwise specified. It is compliant to SFF8472 Rev9.2 with internal calibration mode. For external calibration mode please contact our sales stuff.

PARAMETER	SYMBOL	MIN	MAX	UNIT	NOTES
Temperature monitor absolute error	DMI_Temp	-3	+3	degC	Over operating temp
Laser power monitor absolute error	DMI_TX	-3	+3	dB	
RX power monitor absolute error	DMI_RX	-3	+3	dB	-3dBm to -12dBm range
Supply voltage monitor absolute error	DMI_VCC	-0.08	+0.08	V	Full operating range
Bias current monitor	DMI_Ibias	-10%	10%	mA	

Electrical Characteristics

The following electrical characteristics are defined over the Recommended Operating Environment unless otherwise specified.

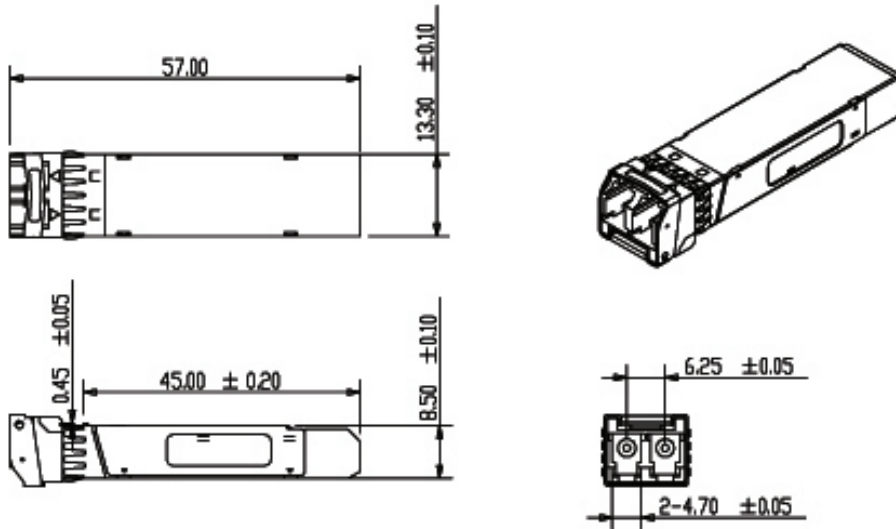
PARAMETER	SYMBOL	MIN	TYPICAL	MAX	UNIT	NOTES
Data Rate		-	10.3125	-	Gbps	
Power Consumption		-	600	800	mW	
TRANSMITTER						
Single Ended Output Voltage Tolerance		-0.3	-	4.0	V	
C common mode voltage tolerance		15	-	-	mV	
Tx Input Diff Voltage	VI	180		1200	mV	
Tx Fault	VoL	-0.3		0.4	V	At 0.7mA
Data Dependent Input Jitter	DDJ			0.10	UI	
Data Input Total Jitter	TJ			0.28	UI	
RECEIVER						
Single Ended Output Voltage Tolerance		-0.3	-	4.0	V	
Rx Output Diff Voltage	Vo	300		850	mV	
Rx Output Rise and Fall Time	Tr/Tf	30			ps	20% to 80%
Total Jitter	TJ			0.70	UI	
Deterministic Jitter	DJ			0.42	UI	

CONTROL AND STATUS I/O TIMING CHARACTERISTICS

Timing characteristics of control and status I/O are included below (Table 8), which is also defined in SFF-8431.

PARAMETER	SYMBOL	MIN	MAX	UNIT	CONDITIONS
TX_Disable assert time	t_of		100	μs	Rising edge of TX_Disable to fall of output signal below 10% of nominal
TX_Disable negate time	t_on		2	ms	Falling edge of TX_Disable to rise of output signal above 90% of nominal. This only applies in normal operation, not during start up or fault recovery
Time To Initialize 2-wire interface	t_2w_start_up		300	ms	From power on or hot plug after the supply meeting Table 8
Time to initialize	t_start_up		300	ms	From power supplies meeting Table 8 or hot plug or TX disable negated during power up, or TX_Fault recovery, until non-cooled power level I part (or non-cooled power level II part already enabled at power level II for TX_Fault recovery) is fully operational.
Time to initialize cooled module	t_start_up_cooled		90	s	From power supplies meeting Table 8 or hot plug, or TX disable negated during power up, or TX_Fault recovery, until cooled power level I part (or cooled power level II part during fault recovery) is fully operational.
Time to Power Up to Level II	t_power_level2		300	ms	From falling edge of stop bit enabling power level II until non-cooled module is fully operational
Time to Power Down from Level II	t_power_down		300	ms	From falling edge of stop bit disabling power level II until module is within power level I requirements
TX_Fault assert	TX_Fault_on		1	ms	From occurrence of fault to assertion of TX_Fault
TX_Fault assert for cooled module	TX_Fault_on_cooled		50	ms	From occurrence of fault to assertion of TX_Fault
TX_Fault Reset	t_reset	10		μs	Time TX_Disable must be held high to reset TX_Fault
RS0, RS1 rate select timing for FC	t_RS0_FC, RS1_FC		500	μs	From assertion till stable output
RS0, RS1 rate select timing non FC	t_RS0, t_RS1		10	ms	From assertion till stable output
Rx_LOS assert delay	t_los_on		100	μs	From occurrence of loss of signal to assertion of Rx_LOS
Rx_LOS negate delay	t_los_off		100	μs	From occurrence of presence of signal to negation of Rx_LOS

MECHANICAL DIMENSIONS



ESD

This transceiver is specified as ESD threshold 2kV for all electrical input pins, tested per MIL-STD-883, Method 3015.4 / JESD22-A114-A (HBM). However, normal ESD precautions are still required during the handling of this module. This transceiver is shipped in ESD protective packaging. It should be removed from the packaging and handled only in an ESD protected environment.

LASER SAFETY

This is a Class 1 Laser Product according to IEC 60825-1:1993+A1:1997+A2:2001. This product complies with 21 CFR 1040.10 and 1040.11 except for deviations pursuant to Laser Notice No. 50, dated (July 26, 2001)