

Product Specification

Long-Wavelength SFP+ 10G Transceiver SFP+10GB-LR

PRODUCT FEATURES

- 10Gb/s serial optical interface compliant to 802.3ae 10GBASE-LR
- 1310nm DFB transmitter, PIN photo-detector
- Duplex LC connector
- Metal enclosure, for lower EMI
- Electrical interface compliant to SFF-8431 specifications for 10 Gigabit “SFP+”
- 2-wire interface for management specifications compliant with SFF 8472
- Single 3.3V power supply
- Operating temperature range: -40°C to 85°C



APPLICATIONS

- Fibre Channel
- 10.325Gb/s Gigabit Ethernet

PRODUCT SELECTION

SFP+10GB-LR

Absolute Maximum Ratings

Parameter	Symbol	Min	Typ	Max	Unit	Ref.
Maximum Supply Voltage	Vcc	-0.5		4.7	V	
Storage Temperature	TS	-40		85	°C	
Case Operating Temperature	TOP	-40		85	°C	

Electrical Characteristics (TOP = -40 to 85°C, VCC = 3.15 to 3.60Volts)

Parameter	Symbol	Min	Typ	Max	Unit	Ref.
Supply Voltage	Vcc	3.15	3.3	3.6	V	
Supply Current	Icc		185	250	mA	
Transmitter						
Input differential impedance	Rin		100		Ω	1

Single ended data input swing	Vin,pp	250		1200	mV	
Transmit Disable Voltage	VD	Vcc-1.3		Vcc	V	
Transmit Enable Voltage	VEN	Vee		Vee+ 0.8	V	2
Transmit Disable Assert Time				10	us	
Receiver						
Single ended data output swing	Vout,pp	250		800	mV	3
Data output rise time	tr		100	175	ps	4
Data output fall time	tf		100	175	ps	4
LOS Fault	VLOS fault	Vcc-0.5		VccHOST	V	5
LOS Normal	VLOS norm	Vee		Vee+0.5	V	5
Power Supply Rejection	PSR	100			mVpp	6

Notes:

1. Connected directly to TX data input pins. AC coupled thereafter.
2. Or open circuit.
3. Into 100 ohms differential termination.
4. 20 – 80 %
5. Loss Of Signal is LVTTTL. Logic 0 indicates normal operation; logic 1 indicates no signal detected.
6. Receiver sensitivity is compliant with power supply sinusoidal modulation of 20 Hz to 1.5 MHz up to specified value applied through the recommended power supply filtering network.

Optical Characteristics (TOP = -40 to 85°C, VCC = 3.15 to 3.60 Volts)

Parameter	Symbol	Min	Typ	Max	Unit	Ref.
Transmitter						
Output Opt. Pwr (End of Life)	POUT	-5.0		0	dBm	1
Optical Wavelength	λ	1270	1310	1360	nm	
Wavelength Temperature Dependance			0.08	0.125	nm/°C	
Spectral Width (-20dB)	σ			3.0	nm	
Optical Extinction Ratio	ER	3.5			dB	
Sidemode Supression ratio	SSRmin	30			dB	
Optical Rise/Fall Time	tr/ tf		100	160	ps	
RIN	RIN			-120	dB/Hz	
Transmitter Jitter (peak to peak)				100	ps	
Receiver						
Average Rx Sensitivity @ 10.325G	RSSENS3			-14.4	dBm	2
Maximum Input Power	PMAX	0.5			dBm	
Optical Center Wavelength	λC	1265	1310	1620	nm	
LOS De -Assert	LOSD			-12	dBm	
LOS Assert	LOSA	-30			dBm	
LOS Hysteresis			1.0		dB	

Notes:

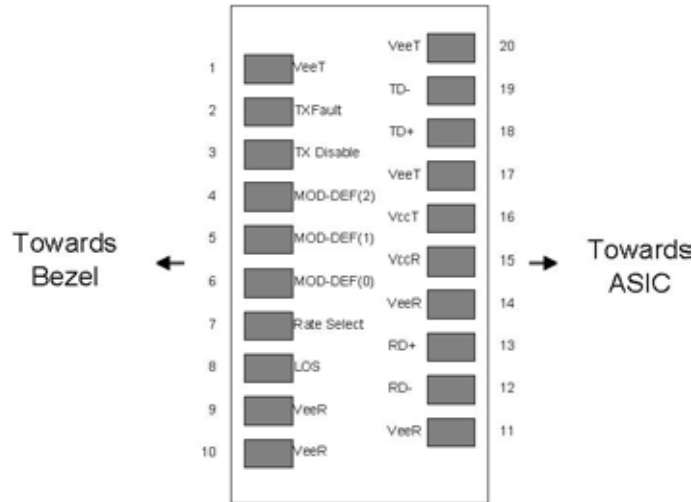
1. Class 1 Laser Safety per FDA/CDRH and IEC-825-1 regulations.
2. With worst-case extinction ratio. Measured with a PRBS 2⁷-1 test pattern, @10.325Gb/s, BER<10⁻¹².

Pin Descriptions

Pin	Symbol	Name/Description	Ref.
1	V _{EET}	Transmitter Ground (Common with Receiver Ground)	1
2	T _{FAULT}	Transmitter Fault.	2
3	T _{DIS}	Transmitter Disable. Laser output disabled on high or open.	3
4	MOD_DEF(2)	Module Definition 2. Data line for Serial ID.	4
5	MOD_DEF(1)	Module Definition 1. Clock line for Serial ID.	4
6	MOD_DEF(0)	Module Definition 0. Grounded within the module.	4
7	Rate Select	No connection required	
8	LOS	Loss of Signal indication. Logic 0 indicates normal operation.	5
9	V _{EER}	Receiver Ground (Common with Transmitter Ground)	1
10	V _{EER}	Receiver Ground (Common with Transmitter Ground)	1
11	V _{EER}	Receiver Ground (Common with Transmitter Ground)	1
12	RD-	Receiver Inverted DATA out. AC Coupled	
13	RD+	Receiver Non-inverted DATA out. AC Coupled	
14	V _{EER}	Receiver Ground (Common with Transmitter Ground)	1
15	V _{CCR}	Receiver Power Supply	
16	V _{CCT}	Transmitter Power Supply	
17	V _{EET}	Transmitter Ground (Common with Receiver Ground)	1
18	TD+	Transmitter Non-Inverted DATA in. AC Coupled.	
19	TD-	Transmitter Inverted DATA in. AC Coupled.	
20	V _{EET}	Transmitter Ground (Common with Receiver Ground)	1

Notes:

1. Circuit ground is internally isolated from chassis ground.
2. T_{FAULT} is an open collector/drain output, which should be pulled up with a 4.7k – 10k Ohms resistor on the host board if intended for use. Pull up voltage should be between 2.0V to Vcc + 0.3V. A high output indicates a transmitter fault caused by either the TX bias current or the TX output power exceeding the preset alarm thresholds. A low output indicates normal operation. In the low state, the output is pulled to <0.8V.
3. Laser output disabled on T_{DIS} >2.0V or open, enabled on T_{DIS} <0.8V.
4. Should be pulled up with 4.7k - 10 kohms on host board to a voltage between 2.0V and 3.6V. MOD_DEF(0) pulls line low to indicate module is plugged in.
5. LOS is open collector output. Should be pulled up with 4.7k – 10 kohms on host board to a voltage between 2.0V and 3.6V. Logic 0 indicates normal operation; logic 1 indicates loss of signal.



Pinout of Connector Block on Host Board

Digital Diagnostic Functions

SFP+10GB-LR transceivers support the 2-wire serial communication protocol as defined in the SFP MSA₁.

The standard SFP serial ID provides access to identification information that describes the transceiver’s capabilities, standard interfaces, manufacturer, and other information.

Additionally, OPTONE SFP+ transceivers provide a unique enhanced digital diagnostic 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 factory set normal range.

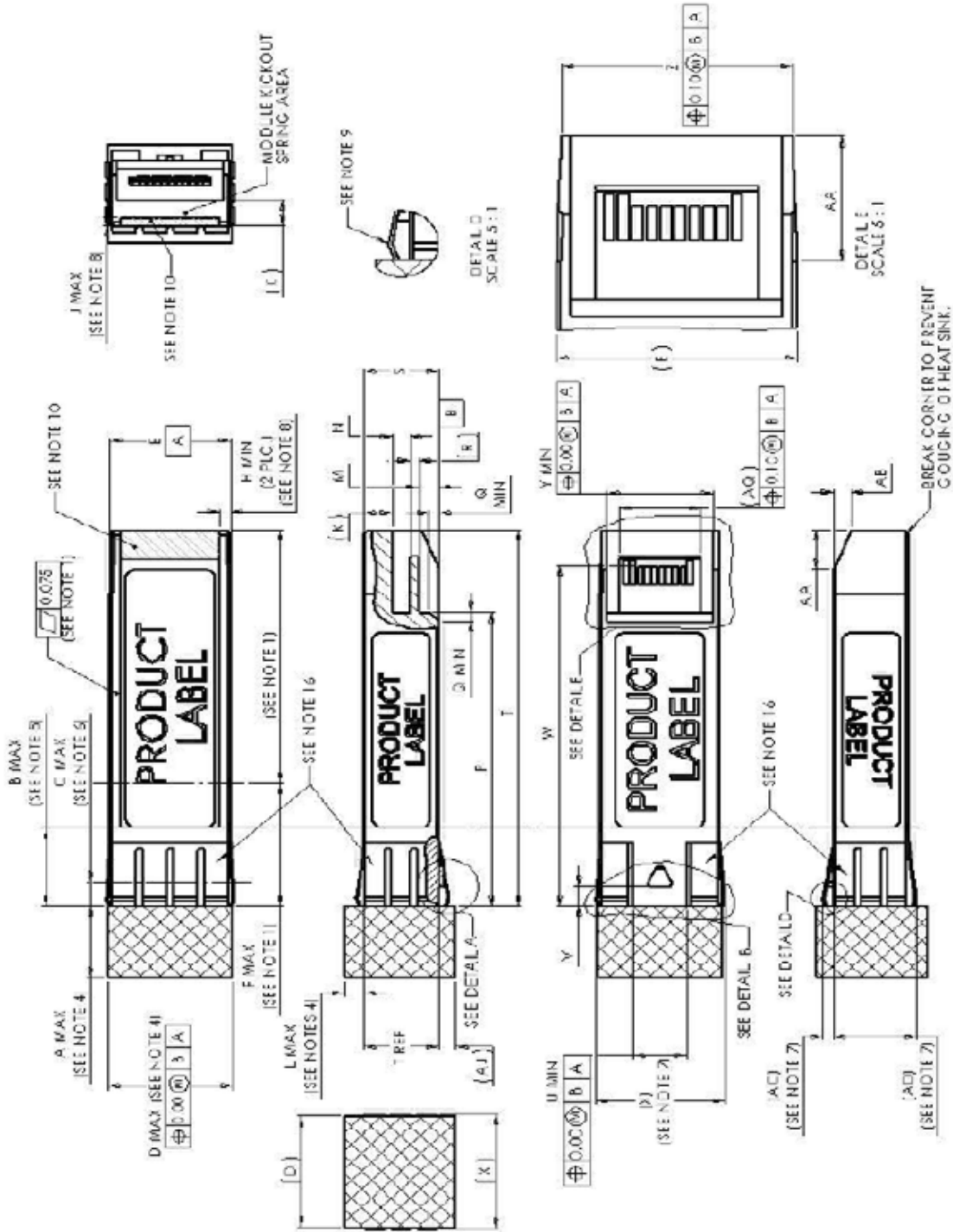
The SFP MSA defines a 256-byte memory map in EEPROM that is accessible over a 2-wire serial interface at the 8 bit address 1010000X (A0h). The digital diagnostic monitoring interface makes use of the 8 bit address 1010001X (A2h), so the originally defined serial ID memory map remains unchanged.

The operating and diagnostics information is monitored and reported by a Digital Diagnostics Transceiver Controller (DDTC) inside the transceiver, which is accessed through a 2-wire serial interface. When the serial protocol is activated, the serial clock signal (SCL, Mod Def 1) is generated by the host. The positive edge clocks data into the SFP transceiver into those segments of the E2PROM that are not write-protected. The negative edge clocks data from the SFP transceiver. The serial data signal (SDA, Mod Def 2) 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.

Digital diagnostics for the SFP+10GB-LR are Internally calibrated by default.

MECHANICAL

Comply to SFF-8432 rev. 5.0, the improved Pluggable form factor specification.



Designator	Dimension (mm)	Tolerance (mm)	Comments
A	10.00	Recommended Maximum	Module length extending outside of cage, see Note 4. Other lengths are application specific.
B	10.00	Maximum	Designated EMI ground spring area, see Note 5
C	3.00	Maximum	EMI spring/Cage Contact Point, see Note 6
D	14.00	Maximum	Module width extending outside of cage, see Note 4
E	13.55	±0.25	Module width
F	15.50	Maximum	Distance to front end of optional heat sink area, see Note 1
H	1.25	Minimum	Top slot distance from edge, see note 8
J	1.00	Maximum	Top slot depth, see note 8
K	3.25	Reference	Height of module kick-out spring area
L	2.10	Maximum	Module top height extending outside of cage see Note 4
M	2.25	±0.10	Distance from bottom of Module to printed circuit board
N	2.00	±0.25	Distance from rear shoulder to printed circuit board
P	37.10	±0.30	Distance from positive stop to bottom opening of Module and beginning of bottom rear relief

Table 10: Key Mechanical Dimensions

Ordering information

Part Number	Product Description
SFP+-10GB-LR	10Gbps, 1310nm SFP+LR 10km, -5oC ~ +70oC