10G SFP+ LR Transceiver

Overview

The 10G SFP+ LR transceiver is a high-performance, cost-efficient solution for long-reach optical links up to 10 km over single-mode fiber. It supports rates from 9.953 to 10.52 Gbps, making it suitable for 10GBASE-LR/LW Ethernet and 10G Fibre Channel applications.

The module integrates a 1310 nm DFB laser and a PIN receiver paired with a low-noise TIA for stable optical performance. A built-in EEPROM provides digital diagnostics through a standard 2-wire SFP management interface.



Features and Benefits

- Hot-pluggable SFP+ MSA module with duplex LC connector
- 1310 nm DFB transmitter and high-sensitivity PIN receiver
- Supports 9.953 to 10.52 Gbps over 10 km 9/125 SMF
- Integrated Digital Diagnostics Monitoring for temperature, power, and voltage
- Single +3.3 V power supply with <0.8 W consumption
- Operating case temperature: 0°C to +70°C

Applications

- 10GBASE-LR/LW 10G Ethernet
- 10G Fibre Channel (1200-SM-LL-L)
- Data center and storage networks

Absolute Maximum Rating

Parameter	Symbol	Min	Max	Unit
Storage Temperature	Ts	-40	+85	ºC
Relative Humidity	RH	0	95	%
Supply Voltage	V_{CC3}	-0.5	4.0	V
RX Input Average Power	Pmax		+1.5	dBm

Recommended Operating Conditions

Parameter	Symbol	Min	Typical	Max	Unit
Operating Case Temperature	Tc	0	25	+70	ºC
Power Supply Voltage	V_{CC3}	3.15	3.3	3.45	V
Power Dissipation	P_D			0.8	W
Supply Current	I_{CC3}			200	mA
Data Rate		9.953	10.3125	10.52	Gbps
Transmission Distance		10			km

Optical Characteristics (Transmitter)					
Parameter	**Symbol**	**Min**	**Typical**	**Max**	**Unit**
Centre Wavelengths	λc	1260	1310	1360	nm
Spectral Width	Δλ			1	nm
Side-Mode Suppression Ratio	SMSR	30			dB
Laser Off Power	P_{off}			-30	dBm
Average Launch Power	PO	-5		0	dBm
Extinction Ratio	ER	3.5			dB
Relative Intensity Noise	$RIN_{12}OMA$			-128	dB/Hz
Optical Return Loss Tolerance	ORLT			12	dB
Transmitter Dispersion Penalty	TDP			3.2	dB
Data Rate		9.953	10.3125	10.52	Gbps
Optical Eye Mask	Compliant with IEEE 802.3ae				
Tx Input Diff Voltage	VI	250		1200	mV

Optical Characteristics (Receiver)					
Parameter	**Symbol**	**Min**	**Typical**	**Max**	**Unit**
Centre Wavelengths	λr	1200	1310	1600	nm
Data Rate		9.953	10.3125	10.52	Gbps
Receiver Sensitivity in Average Power	Psen			-14	dBm
Receiver Sensitivity (OMA), each lane				-12.6	dBm
Stressed Receiver Sensitivity (OMA)				-10.3	dBm
LOS Assert	LosA	-24			dBm
LOS De-Assert	LosD			-19	dBm
LOS Hysteresis	LosH	0.5		4.5	dB
Receiver Overload (Average Power)	Pmax	0.5			dBm
Receiver Reflectance				-12	dB
Rx Output Diff Voltage	V_o	250		800	mV

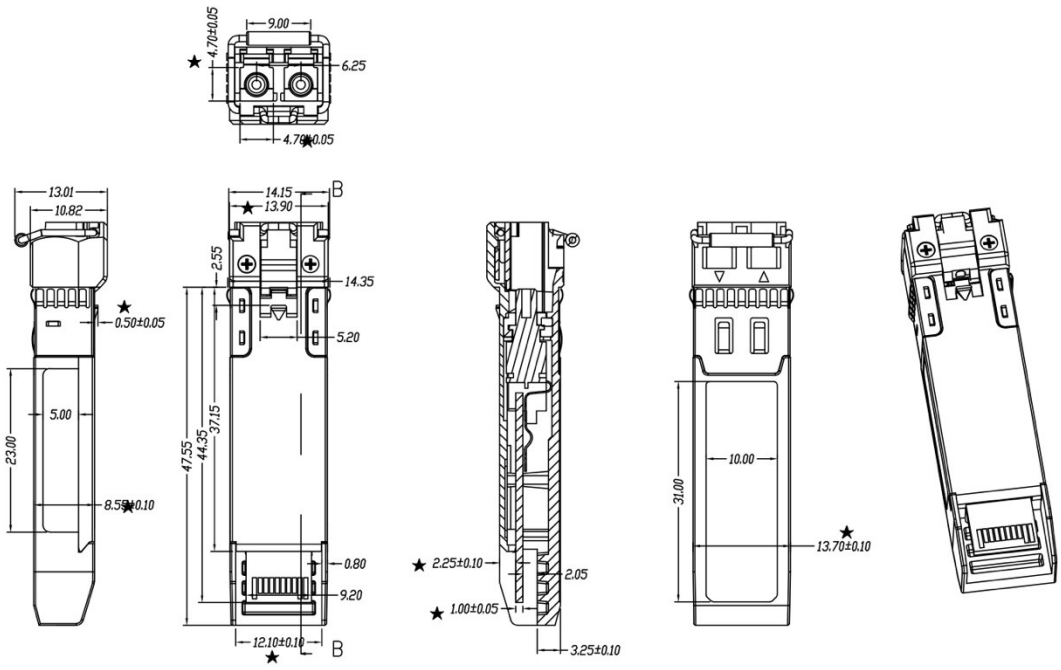
Digital Diagnostics						
Parameter	**Symbol**	**Min**	**Typical**	**Max**	**Unit**	**Notes**
Temperature Monitor Absolute Error	DMI_Temp	-3		3	°C	Over operating temperature
Supply Voltage Monitor Absolute Error	DMI_Vcc	-0.1		0.1	V	Over operating voltage
Bias Current Monitor Absolute Error	DMI_Ibias	-10%		10%	mA	
Laser Power Monitor Absolute Error	DMI_Tx	-3		3	dB	
RX Power Monitor Absolute Error	DMI_Rx	-3		3	dB	

Control and Status I/O Timing						
Parameter	**Symbol**	**Min**	**Typical**	**Max**	**Unit**	**Notes**
TX Disable Assert Time	t_off			100	µs	Note 1
TX Disable Negate Time	t_on			2	ms	Note 2
Time to Initialize Including Reset of TX_Fault	t_init			300	ms	Note 3
TX Fault Assert Time	t_fault_on			1	ms	Note 4
TX Fault Reset Time	t_reset	10		-	µs	Note 5
LOS Assert Time	t_loss_on			100	µs	Note 6
LOS De-Assert Time	t_loss_off			100	µs	Note 7

NOTES:

1. Time from rising edge TX Disable to when the optical output falls below 10% of nominal.
2. Time from falling edge TX Disable to when the modulated optical output rises above 90% of nominal.
3. From power on or negation of TX Fault using TX Default.
4. Time from fault to TX fault on.
5. Time from TX Fault to TX nominal.
6. Time from LOS state to RX LOS assert.
7. Time from non-LOS state to RX LOS de-assert.

Mechanical Specifications



Pin-Out Definition

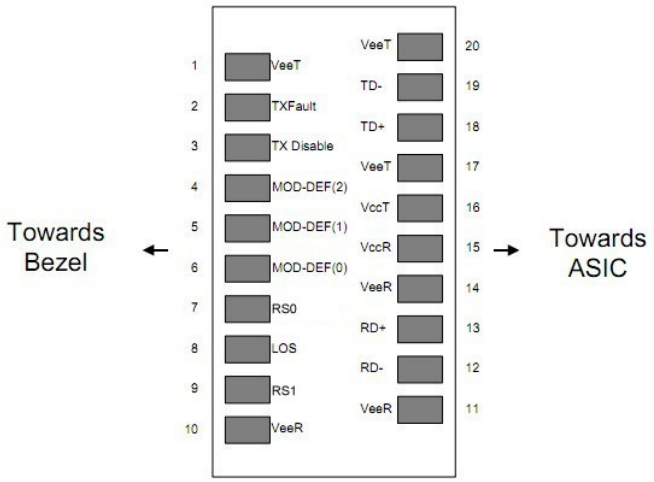


Diagram of Host Board Connector Block Pin Numbers and Names

Pin	Symbol	Description	Notes
1	VEET	Transmitter Ground (Common with Receiver Ground)	7.1
2	TFAULT	Transmitter Fault.	
3	TDIS	Transmitter Disable. Laser output disabled on high or open.	7.2
4	MOD_DEF(2)	Module Definition 2. Data line for Serial ID.	7.3
5	MOD_DEF(1)	Module Definition 1. Clock line for Serial ID.	7.3
6	MOD_DEF(0)	Module Definition 0. Grounded within the module.	7.3
7	RS0	Rate Select0, optionally controls SFP+ module receiver. When high input signaling rate>4.25 GBd and when low input signaling rate<4.25GBd	
8	LOS	Loss of Signal indication. Logic 0 indicates normal operation.	7.4
9	RS1	Rate Select1, optionally controls SFP+ module receiver. When high input signaling rate>4.25 GBd and when low input signaling rate<4.25GBd	
10	VEER	Receiver Ground (Common with Transmitter Ground)	7.1
11	VEER	Receiver Ground (Common with Transmitter Ground)	7.1
12	RD-	Receiver Inverted DATA out. AC Coupled.	
13	RD+	Receiver Non-inverted DATA out. AC Coupled.	
14	VEER	Receiver Ground (Common with Transmitter Ground)	7.1
15	VCCR	Receiver Power Supply	
16	VCCT	Transmitter Power Supply	
17	VEET	Transmitter Ground (Common with Receiver Ground)	7.1
18	TD+	Transmitter Non-Inverted DATA in. AC Coupled.	
19	TD-	Transmitter Inverted DATA in. AC Coupled.	
20	VEET	Transmitter Ground (Common with Receiver Ground)	7.1

NOTES:

1. Circuit ground is internally isolated from chassis ground.
2. Laser output disabled on TDIS >2.0V or open, enabled on TDIS <0.8V.
3. Should be pulled up with 4.7k - 10kohms on host board to a voltage between 2.0V and 3.6V. MOD_DEF(0) pulls line low to indicate module is plugged in.
4. LOS is open collector output. Should be pulled up with 4.7k -10kohms on host board to a voltage between 2.0V and 3.6V. Logic 0 indicates normal operation; logic 1 indicates loss of signal.

Standards Compliance

- IEEE 802.3ae-2002
- MSA SFF-8472
- MSA SFF-8431
- RoHS
- Class 1 Laser: FDA, EN 60825-1, EN 60950

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