

AT-SFP-S1013L-20

Optical SFP Module

10Gbps SFP+ Transceiver SM 1310nm 20km LC



FEATUTES

- Supports up to 10.7Gbps bit rates
- 1310nm DFB laser and PIN photodiode, Up to 20km for SMF transmission
- Compliant with SFP+ MSA and SFF-8472 with duplex LC receptacle
- Hot-pluggable SFP+ footprint
- Real Time Digital Diagnostic Monitoring
- Single +3.3V power supply
- Compatible with RoHS
- Operating case temperature: Standard: 0 to +70° C Industrial: -40 to +85° C

APPLICATION

- 10GBASE-LR & 10G Ethernet
- 10G Fiber Channel

STANDARD

- Compliant with MSA SFP specification(SFF-8431, SFF-8432, SFF-8472)
- Compliant with IEC
- Compliant with IEEE 802.3ae

DESCRIPTION

The SFP transceivers are high performance, cost effective modules supporting dual data-rate of 10Gbps and 20km transmission distance with SMF.

The transceiver consists of three sections: a FP laser transmitter, a PIN photodiode integrated with a trans-impedance preamplifier (TIA) and MCU control unit. All modules satisfy class I laser safety requirements.

The transceivers are compatible with SFP Multi-Source Agreement (MSA). For further information, please refer to SFP MSA.

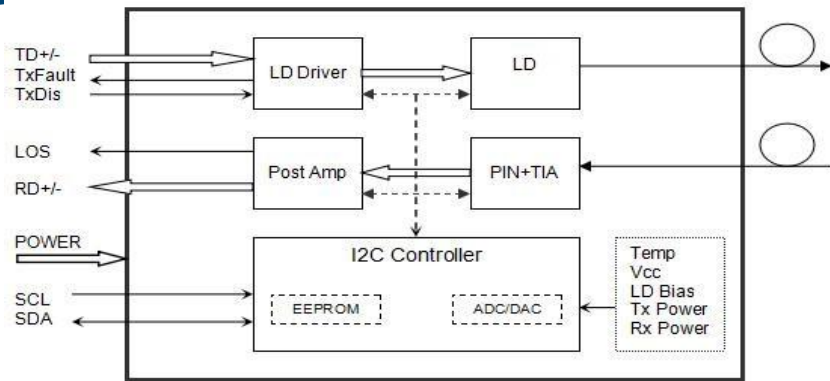
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ABSOLUTE MAXIMUM RATINGS

Parameter	Symb ol	Min	Max	Unit
Supply Voltage	Vcc	0.5	-4.5	V
Storage Temperature	Ts	-40	+85	°C
Operating Humidity	-	5	85	%

RECOMMENDED OPERATING CONDITIONS

Parameter		Symbol	Min	Typical	Max	Unit
Operating Case Temperature	Standard	Tc	0		+70	°C
	Industrial		-40		+85	°C
Power Supply Voltage		Vcc	3.135	3.30	3.465	V
Power Supply Current		Icc			350	mA
Data Rate				10.3	10.7	Gbps
Transmission Distance				20		km

OPTICAL AND ELECTRICAL CHARACTERISTICS

Parameter	Symbol	Min	Typical	Max	Unit	Notes
Transmitter						
Centre Wavelength	λ_c	1270	1310	1350	nm	
Side-Mode Suppression Ratio	SMSR	30	-		dB	
Average Output Power	P _{out}	-6.5		-0.5	dBm	1
Extinction Ratio	ER	3.5			dB	
Data Input Swing Differential	V _{IN}	180		850	mV	2

Input Differential Impedance		Z_{IN}	90	100	110	Ω	
TX Disable	Disable		2.0		V_{CC}	V	
	Enable		0		0.8	V	
TX Fault	Fault		2.0		V_{CC}	V	
	Normal		0		0.8	V	
Receiver							
Centre Wavelength		λ_c	1260		1600	nm	
Receiver Sensitivity					-14.4	dBm	3
Receiver Overload			0.5			dBm	3
LOS De-Assert		LOS_D			-17	dBm	
LOS Assert		LOS_A	-30			dBm	
LOS Hysteresis			0.5			dB	
Data Output Swing Differential		V_{out}	300		900	mV	4
LOS	High		2.0		V_{CC}	V	
	Low				0.8	V	

NOTES

1. The optical power is launched into SMF.
2. PECL input, internally AC-coupled and terminated.
3. Measured with a PRBS 2⁷-1 test pattern @1250Mbps, BER $\leq 1 \times 10^{-12}$.
4. Internally AC-coupled.

TIMING AND ELECTRICAL

Parameter	Symbol	Min	Typical	Max	Unit
Tx Disable Negate Time	t_{on}			1	ms
Tx Disable Assert Time	t_{off}			10	μs
Time To Initialize, including Reset of Tx Fault	t_{init}			300	ms
Tx Fault Assert Time	t_{fault}			100	μs
Tx Disable To Reset	t_{reset}	10			μs
LOS Assert Time	t_{loss_on}			100	μs

LOS De-assert Time	t_loss_off			100	μs
Serial ID Clock Rate	f_serial_clock			400	KHz
MOD_DEF (0:2)-High	V _H	2		V _{cc}	V
MOD_DEF (0:2)-Low	V _L			0.8	V

DIAGNOSTICS

Parameter	Range	Unit	Accuracy	Calibration
Temperature	0 to +70	°C	±3°C	Internal / External
	-40 to +85			
Voltage	3.0 to 3.6	V	±3%	Internal / External
Bias Current	0 to 100	mA	±10%	Internal / External
TX Power	-9 to -3	dBm	±3dB	Internal / External
RX Power	-23 to -3	dBm	±3dB	Internal / External

DIGITAL DIAGNOSTIC MEMORY MAP

The transceivers provide serial ID memory contents and diagnostic information about the present operating conditions by the 2-wire serial interface (SCL, SDA).

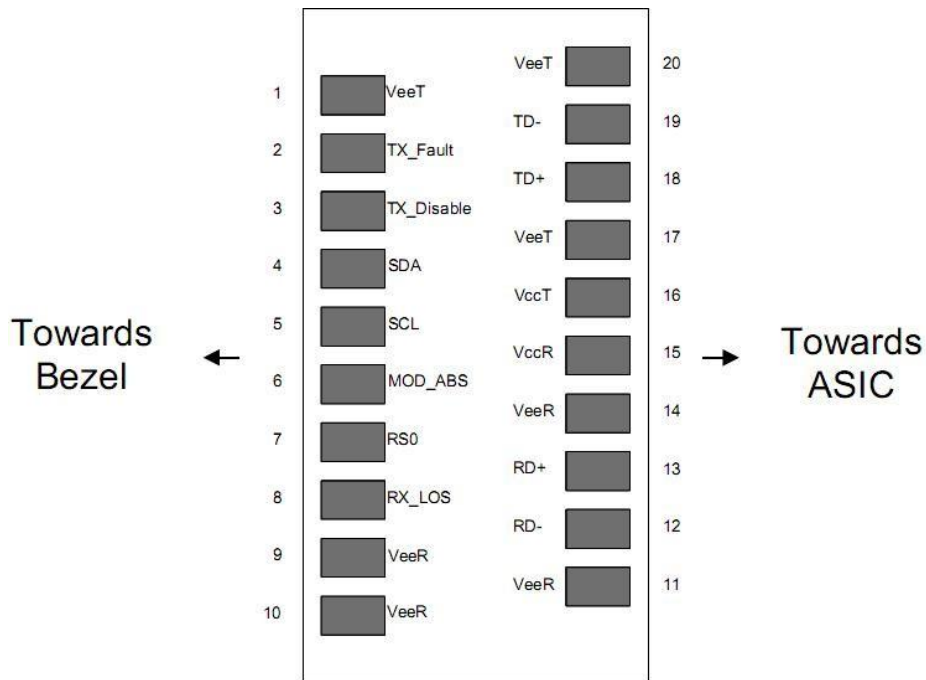
The diagnostic information with internal calibration or external calibration all are implemented, including received power monitoring, transmitted power monitoring, bias current monitoring, supply voltage monitoring and temperature monitoring.

The digital diagnostic memory map specific data field defines as following.

2 wire address 1010000X (A0h)	2 wire address 1010001X (A2h)
0	0
Serial ID Defined by SFP MSA (96 bytes)	Alarm and Warning Thresholds (56 bytes)
95	55
Vendor Specific (32 bytes)	Cal Constants (40 bytes)
127	95
Reserved (128 bytes)	Real Time Diagnostic Interface (24 bytes)
255	119
	127
	User Writable EEPROM (120 bytes)
	247
	Vendor Specific (8 bytes)
	255

PIN DEFINITIONS

Pin Diagram



PIN DESCRIPTIONS

Pin	Signal Name	Description	Plug Seq.	Notes
1	V _{EET}	Transmitter Ground	1	
2	TX FAULT	Transmitter Fault Indication	3	Note 1
3	TX DISABLE	Transmitter Disable	3	Note 2
4	SDA	SDA Serial Data Signal	3	
5	SCL	SCL Serial Clock Signal	3	
6	MOD_ABS	Module Absent. Grounded within the module	3	
7	RS0	Not Connected	3	
8	LOS	Loss of Signal	3	Note 3
9	V _{EER}	Receiver ground	1	
10	V _{EER}	Receiver ground	1	
11	V _{EER}	Receiver ground	1	
12	RD-	Inv. Received Data Out	3	Note 4
13	RD+	Received Data Out	3	Note 4
14	V _{EER}	Receiver ground	1	
15	V _{CCR}	Receiver Power Supply	2	
16	V _{CCT}	Transmitter Power Supply	2	
17	V _{EET}	Transmitter Ground	1	
18	TD+	Transmit Data In	3	Note 5

19	TD-	Inv. Transmit Data In	3	Note 5
20	V _{EET}	Transmitter Ground	1	

NOTES

Plug Seq.: Pin engagement sequence during hot plugging.

1. TX Fault is an open collector output, which should be pulled up with a 4.7k~10kΩ resistor on the host board to a voltage between 2.0V and V_{cc}+0.3V. Logic 0 indicates normal operation; Logic 1 indicates a laser fault of some kind. In the low state, the output will be pulled to less than 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 4.7k~10kΩ resistor. Its states are:

Low (0 to 0.8V): Transmitter on

(>0.8V, < 2.0V): Undefined

High (2.0 to 3.465V): Transmitter Disabled Open: Transmitter Disabled

3. Mod-Def 0, 1, 2. These are the module definition pins. They should be pulled up with a 4.7k~10kΩ resistor on the host board. The pull-up voltage shall be V_{cc}T or V_{cc}R.

Mod-Def 0 is grounded by the module to indicate that the module is present Mod-Def 1 is the clock line of two wire serial interface for serial ID

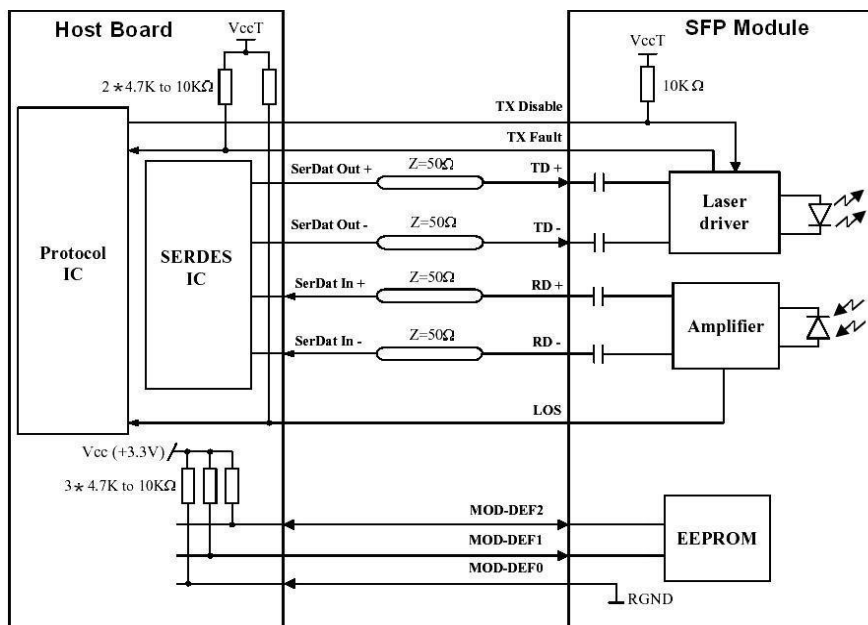
Mod-Def 2 is the data line of two wire serial interface for serial ID

4. LOS is an open collector output, which should be pulled up with a 4.7k~10kΩ resistor. Pull up voltage between 2.0V and V_{cc}+0.3V. Logic 1 indicates loss of signal; Logic 0 indicates normal operation. In the low state, the output will be pulled to less than 0.8V.

5. RD-/+ : These are the differential receiver outputs. They are internally AC-coupled 100 differential lines which should be terminated with 100Ω (differential) at the user SERDES.

6. TD-/+ : These are the differential transmitter inputs. They are internally AC-coupled, differential lines with 100Ω differential termination inside the module.

RECOMMENDED INTERFACE CIRCUIT



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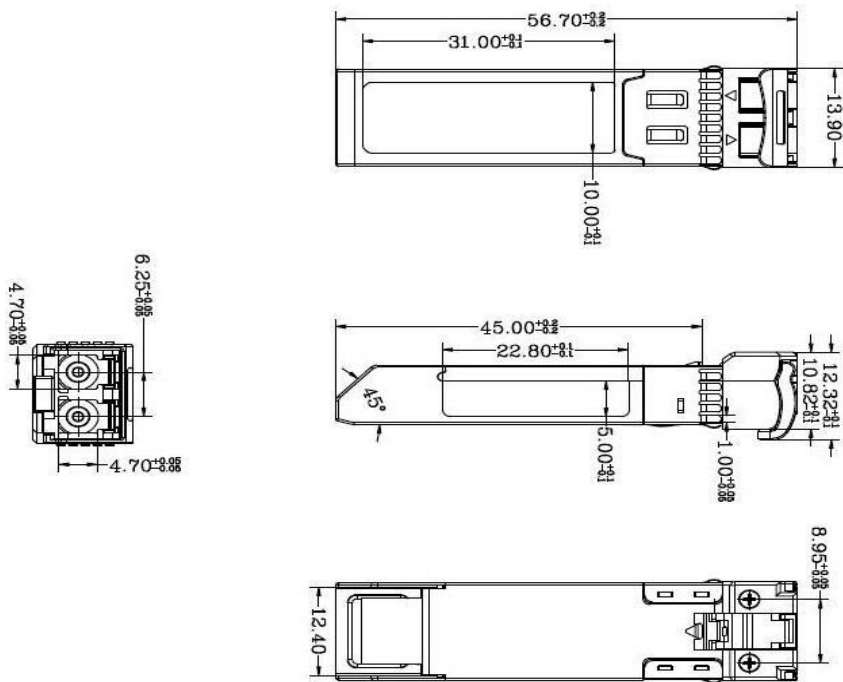
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MECHANICAL DIMENSIONS



ORDERING INFORMATION

Model No.	Product Description
AT-SFP-S1013L-20	10Gbps, 1310nm, LC, 20km, 0° C~+70° C, with DDM
AT-SFP-S1013L-20I	10Gbps, 1310nm, LC, 20km, -40° C~+85° C, with DDM

ORDERING INFORMATION: -

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