

# SO-SFP-1G-10G-LR

SFP+, 1/10GBase-LR, 1310nm, SM, DDM, 11.5dB@1.25Gbps, 8.4dB@10.3Gbps, 10km

## OVERVIEW

The SO-SFP-1G-10G-LR series multi-mode transceiver is SFP+ module with dual rate selectable for duplex optical data communications such as 1000BASE-LX, 10GBASE-LR and 10GBASE-LW and so on. It is with the SFP+ 20-pin connector to allow hot plug capability. Digital diagnostic functions are available via an I2C. This module is designed for multi-mode fiber and operates at a nominal wavelength of 1310 nm. The transmitter section uses a 1310 nm DFB laser and is a Class 1 laser according to International Safety Standard IEC 60825. The receiver section uses an integrated GaAs detector preamplifier (IDP) mounted in an optical header and a limiting post-amplifier IC.

## PRODUCT FEATURES

- Data rate selectable for 1.25G or 9.95~10.3G
- 1310nm DFB-LD transmitter
- Distance up to 10km
- Single 3.3V power supply and TTL logic interface
- Duplex LC connector interface
- Hot-Pluggable
- Power dissipation < 1.0W
- Compliant with MSA SFP+ specification SFF-8431
- Compliant with IEEE 802.3ae 10GBASE-LR/LW
- Compliant with IEEE 802.3
- Operating case temperature
  - Standard: -5°C~+70°C
  - Industrial: -40°C~+85°C

## APPLICATIONS

- 10GBASE-LR at 10.31Gbps
- 10GBASE-LW at 9.95Gbps
- 1000BASE-LX 1G Ethernet
- Other optical links

## ORDERING INFORMATION

Part Number	Description
SO-SFP-1G-10G-LR	SFP+, 1/10GBase-LR, 1310nm, SM, DDM, 11.5dB@1.25Gbps, 8.4dB@10.3Gbps, 10km
SO-SFP-1G-10G-LR-I	SFP+, 1/10GBase-LR, 1310nm, SM, DDM, 11.5dB@1.25Gbps, 8.4dB@10.3Gbps, 10km, ind.temp

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## ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Min	Max	Unit
Storage Temperature	TS	-40	+85	°C
Supply Voltage	VCC	-0.5	3.6	V
Operating Relative Humidity	Vin	-0.5	Vcc	V
Output Current	Io		50	mA

## RECOMMENDED OPERATING CONDITIONS

Parameter	Symbol	Min	Typ	Max	Unit
Operating Case Temperature	Tc	SO-SFP-1G-10G-LR		+70	°C
		SO-SFP-1G-10G-LR -I	-5		°C
		-40		+85	°C
Power Supply Voltage	Vcc	3.135	3.3	3.465	V
Power Supply Current	Icc			300	mA
Surge Current	ISurge			+30	mA
Data rate	10GBASE-LR		10.3		Gbps
	10GBASE-LW		9.95		
	1000BASE-LX		1.25		

## PERFORMANCE SPECIFICATIONS – ELECTRICAL TRANSMITTER

Parameter	Symbol	Min	Typ	Max	Unit	Notes
CML Inputs(Differential)	V <sub>IN</sub>	180		700	mVpp	AC coupled inputs
Input AC Common Mode Voltage		0		25	mV	RMS
Input Impedance (Differential)	Z <sub>IN</sub>	85	100	115	ohms	Rin > 100 kohms @ DC
Differential Input S-parameter	S <sub>DD11</sub>			-12	dB	
Differential to Common Mode Conversion	S <sub>CD11</sub>			-10	dB	
TX Disable	Disable	2		Vcc	V	Io =400µA; Host Vcc
	Enable	0		0.8		
TX FAULT	Fault	2		Vcc+0.3	V	Io = -4.0mA
	Normal	0		0.8		

## PERFORMANCE SPECIFICATIONS – ELECTRICAL RECEIVER

Parameter	Symbol	Min	Typ	Max	Unit	Notes
CML Outputs (Differential)	$V_{out}$	300		850	mVpp	AC coupled outputs
Output AC Common Mode Voltage		0		15	mV	RMS
Output Impedance (Differential)	$Z_{out}$	85	100	115	ohm	
Differential Output S-parameter	$SD_{22}$			.12	dB	0.01~1GHZ 1~11.1GHZ
Rx_LOS Output Voltage – High		2		$V_{cc}+0.3$	V	$I_o = 400\mu A$ ; Host $V_{cc}$
Rx_LOS Output Voltage – Low		0		0.8	V	$I_o = -4.0mA$
MOD_DEF ( 2:0 )	$V_{oH}$	2.5			V	With Serial ID
	$V_{oL}$	0		0.5	V	

## OPTICAL AND ELECTRICAL CHARACTERISTICS

Parameter	Symbol	Min	Typ	Max	Unit
9 $\mu m$ Core Diameter SMF			10		km
Data Rate	10GBASE-LR		10.3		Gbps
	1000BASE-LX		1.25		

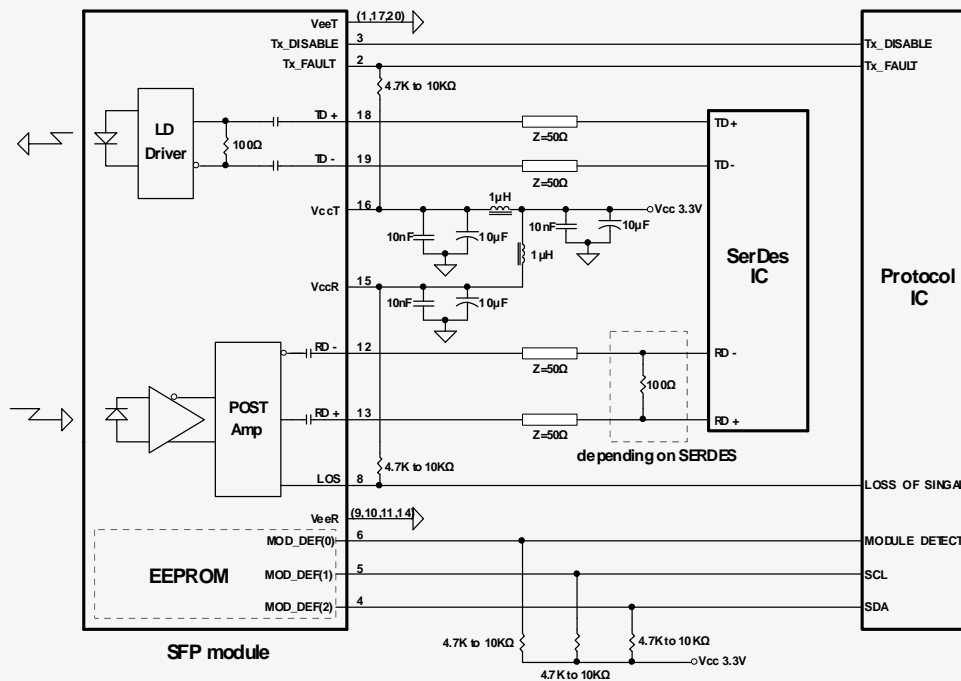
## OPTICAL AND ELECTRICAL CHARACTERISTICS TRANSMITTER

Parameter	Symbol	Min	Typ	Max	Unit
Centre Wavelength	$\lambda_c$	1260	1310	1355	nm
Spectral Width (-20dB)	$\Delta\lambda$			1	nm
Average Output Power	$P_{out@10.3Gbps}$	-6		0	dBm
	$P_{out@1.25Gbps}$	-9.5		-3	
Extinction Ratio	$ER@10.3Gbps$	3.5			dB
	$ER@1.25Gbps$	9			
Average Power of OFF Transmitter	$P_{off}$			-30	dBm
Side Mode Suppression Ratio	$SMSR$	30			dB
Transmitter Dispersion Penalty	$TDP$			3.2	dB
Input Differential Impedance	$Z_{in}$	85	100	115	$\Omega$
TX Disable	Disable	2.0		$V_{cc}+0.3$	V
	Enable	0		0.8	
TX_Fault	Fault	2.0		$V_{cc}+0.3$	V
	Normal	0		0.8	

## OPTICAL AND ELECTRICAL CHARACTERISTICS RECEIVER

Parameter	Symbol	Min	Typ	Max	Unit
Centre Wavelength	$\lambda_c$	1260		1565	nm
Receiver Sensitivity	$P_{min} @10.3Gbps$			-14.4	dBm
	$P_{min} @1.25Gbps$			-21	
Receiver Overload	$P_{max}$	0.5			dBm
Optical Return Loss	ORL			-12	dB
LOS De-Assert	$LOSD @10.3Gbps$			-15	dBm
	$LOSD @1.25Gbps$			-22	
LOS Assert	$LOSA @10.3Gbps$	-25			dBm
	$LOSA @1.25Gbps$	-35			
LOS	High	2.0		VCC+0.3	V
	Low	0		0.8	

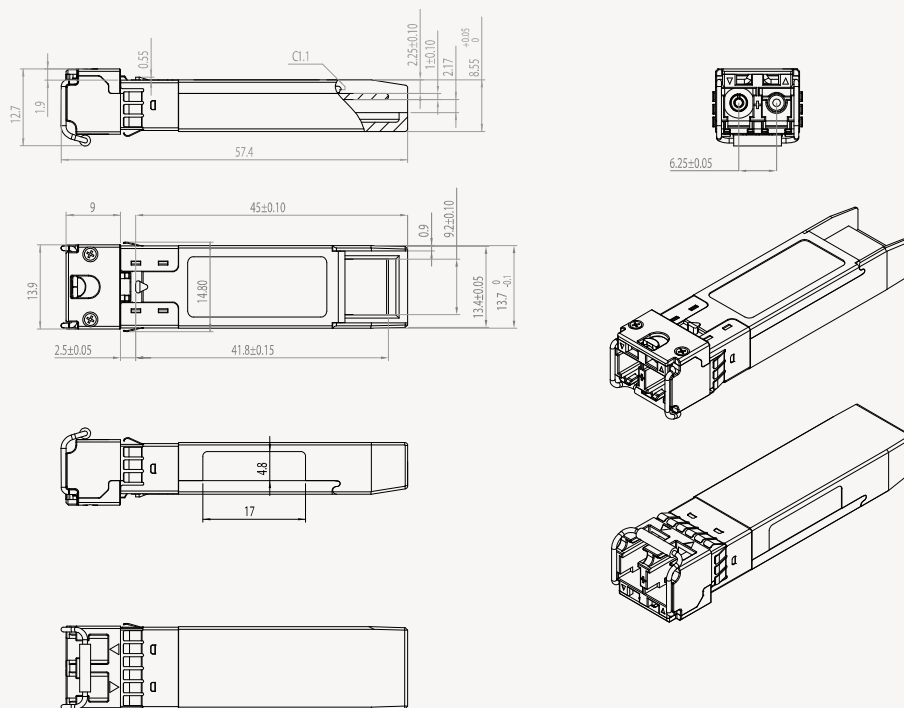
## RECOMMENDED CIRCUIT SCHEMATIC



## PIN FUNCTION DEFINITIONS

PIN	Signal Name	Description	PIN	Signal Name	Description
1	V <sub>EE</sub> T	Transmitter Signal Ground	11	V <sub>EE</sub> R	Receiver Signal Ground
2	TX_Fault	Transmitter Fault Indication. Logic "1" Output = Laser Fault. Logic "0" Output = Normal Operation	12	RD-	Inverse Receiver Data Out
3	TX_Disable	Logic "1" Input (or no connection) = Laser off, Logic "0" = Laser on.	13	RD+	Receiver Data Out
4	SDA	Modulation Definition 2 – Two wires serial ID Interface	14	V <sub>EE</sub> R	Receiver Signal Ground
5	SDL	Modulation Definition 1 – Two wires serial ID Interface	15	V <sub>CC</sub> R	Receiver Power – 3.3V±5%
6	MOD-ABS	Modulation Definition 0 – Ground in Module	16	V <sub>CC</sub> T	Transmitter Power – 3.3V±5%
7	RS0	RX Rate Select (LVTTTL). This pin has an internal 30k pulldown to ground. A signal on this pin will not affect module performance.	17	V <sub>EE</sub> T	Transmitter Signal Ground
8	RX_LOS	Loss of Signal Out (OC).	18	TD+	Transmitter Data In
9	RS1	TX Rate Select (LVTTTL). This pin has an internal 30k pulldown to ground. A signal on this pin will not affect module performance.	19	TD-	Inverse Transmitter Data In
10	V <sub>EE</sub> R	Receiver Signal Ground	20	V <sub>EE</sub> T	Transmitter Signal Ground

## MECHANICAL DRAWING



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