



Professional high-speed optical transceiver

**OPN-SG1513-10SC / OPN-SG1513-10SCI /
OPN-SG1513-10LC / OPN-SG1513-10LCI**

1550 nm TX / 1310 nm RX , 3.3V / 1250 Mbps Digital Diagnostic Single-Fiber SFP Transceiver

PRODUCT FEATURES

- 1-Fiber Bi-Directional SFP Optical Transceiver
- Compliant with IEEE 802.3ah-2004 1000BASE-BX
 - Simplex SC Connector: OPN-SG1513-10SC
 - Simplex LC Connector: OPN-SG1513-10LC
 - SFF-8472 Digital Diagnostic Function
 - 1550 nm DFB LD Transmitter
 - 1310 nm Receiver
 - Distance Up to 10 km
 - AC/AC Coupling according to MSA
 - Single +3.3 V Power Supply
 - RoHS Compliant
 - 0 to 70°C Operation: OPN-SG1513-10SC
 - -50 to 85°C Operation: OPN-SG1513-10SCI
- Class 1 Laser International Safety Standard IEC 60825Compliant

APPLICATIONS

- WDM Gigabit Ethernet Links
- SONET/SDH Equipment Interconnect
 - Fibre Channel Links

PRODUCT DESCRIPTION

The OPN-SG1513-10SCI series are small form factor pluggable modules for Gigabit Ethernet 1000BASE-BX and Fibre Channel single fiber communications by using 1550 nm transmitter and 1310 nm receiver. It is with the SFP 20-pin connector to allow hot plug capability. Digital diagnostic functions are available via an I²C. The transmitter section uses a multiple quantum well 1550 nm DFB laser and is a class 1 laser compliant according to International Safety Standard IEC 60825. The receiver section uses an integrated 1310 nm detector preamplifier (IDP) mounted in an optical header and a limiting post-amplifier IC.

ORDER INFORMATION

P/No.	Bit Rate (Gb/s)	Distance (km)	TX (nm)	RX (nm)	Package	Temp (°C)	TX Power (dBm)	RX Sens. (dBm)	RoHS Compliant
OPN-SG1513-10SC	1.25	10	1550 DFB	1310	SC SFP with DMI	0 to 70	-3 to -9	-20	Yes
OPN-SG1513-10SCI	1.25	10	1550 DFB	1310	SC SFP with DMI	-50 to 85	-3 to -9	-20	Yes
OPN-SG1513-10LC	1.25	10	1550 DFB	1310	LC SFP with DMI	0 to 70	-3 to -9	-20	Yes
OPN-SG1513-10LCI	1.25	10	1550 DFB	1310	LC SFP with DMI	-50 to 85	-3 to -9	-20	Yes

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Absolute Maximum Ratings					
Parameter	Symbol	Min	Max	Units	Notes
Storage Temperature	Tstg	-50	85	°C	
Operating Case Temperature	Topr	0 -50	70 85	°C	OPN-SG1513-10SC OPN-SG1513-10SCI
Relative Humidity	RH	0	85	%	No condensing
Power Supply Voltage	Vcc	0	3.6	V	
Input Voltage	---	GND	Vcc	V	
Output Current	Iout	0	30	mA	

Recommended Operating Conditions					
Parameter	Symbol	Min	Typ	Max	Units / Notes
Power Supply Voltage	Vcc	3.1	3.3	3.5	V
Power Supply Current	I _{CC} (TX+RX)		200	300	mA
Operating Case Temperature	Topr	0 -50		70 85	°C / OPN-SG1513-10SC °C / OPN-SG1513-10SCI
Data Rate			1250	1300	Mb/s

Transmitter Specifications (0°C < Topr < 70°C, 3.1V < Vcc < 3.5V)						
Parameter	Symbol	Min	Typ	Max	Units	Notes
Optical						
Optical Transmit Power	P _o	-9		-3	dBm	1
Output Center Wavelength	λ	1480		1580	nm	
Output Spectrum Width	Δλ			1	nm	-20 dB width
Side Mode Suppression Ratio	SMSR	30			dB	
Extinction Ratio	E _R	9			dB	
Output Eye	Compliant with IEEE 802.3z					
Optical Rise Time	t _r			0.26	ns	20% to 80% Values
Optical Fall Time	t _f			0.26	ns	20% to 80% Values
Relative Intensity Noise	RIN			-120	dB/Hz	
Total Jitter	TJ			0.227	ns	2
Electrical						
Data Input Current – Low	I _{IL}	-350			μA	
Data Input Current – High	I _{IH}			350	μA	
Differential Input Voltage	V _{IH} - V _{IL}	0.5		2.4	V	Peak-to-Peak
TX Disable Input Voltage – Low	T _{DIS, L}	0		0.5	V	3
TX Disable Input Voltage – High	T _{DIS, H}	2.0		Vcc	V	3
TX Disable Assert Time	T _{ASSERT}			10	μs	
TX Disable Deassert Time	T _{DEASSERT}			1	ms	
TX Fault Output Voltage -- Low	T _{FaultL}	0		0.5	V	4
TX Fault Output Voltage -- High	T _{FaultH}	2.0		Vcc+0.3	V	4

Notes: 1. Output power is power coupled into a 9/125 μm single mode fiber.

2. Measured with a 2⁷-1 PRBS

3. There is an internal 4.7K to 10K ohm pull-up resistor to VccTX.

4. Open collector compatible, 4.7K to 10K ohm pull-up to Vcc (Host Supply Voltage).

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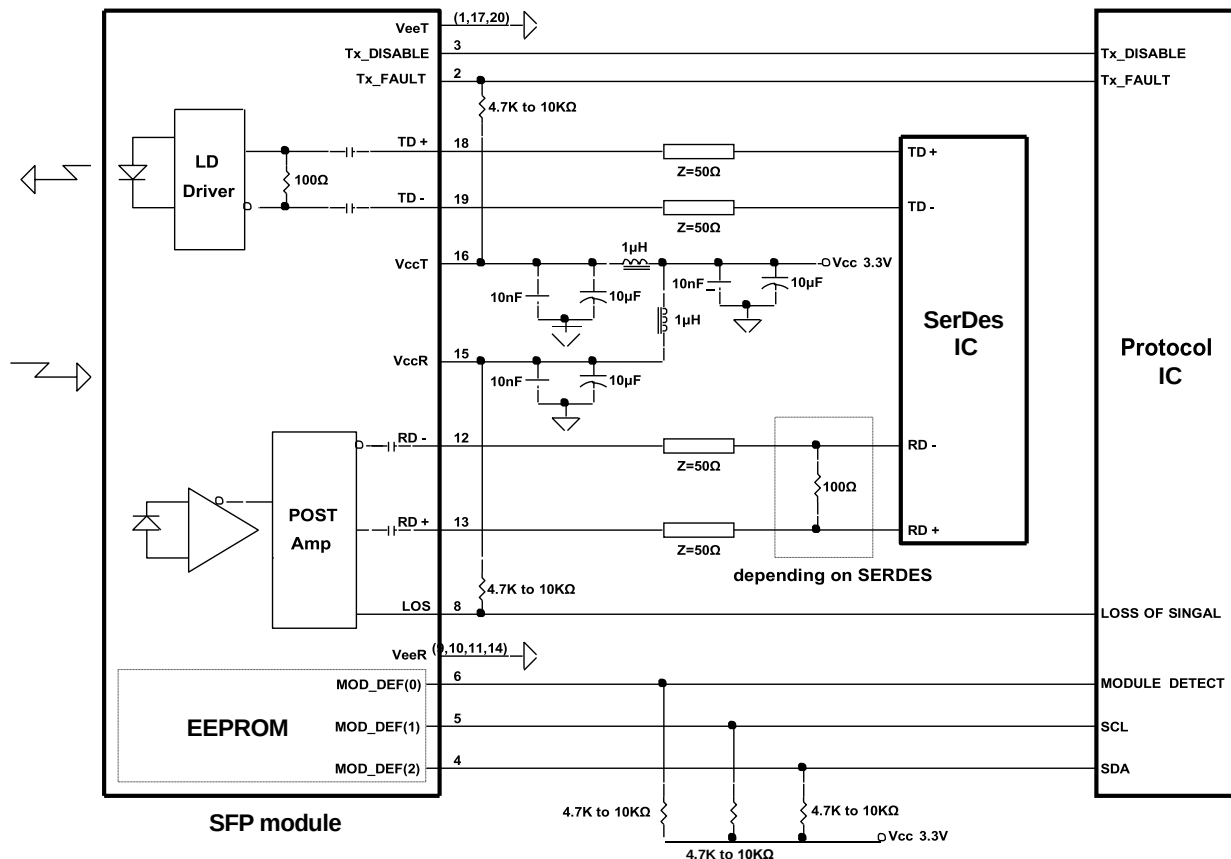
Receiver Specifications (0°C < Topr < 70°C, 3.1 V < Vcc < 3.5V)						
Parameter	Symbol	Min	Typ	Max	Units	Notes
Optical						
Sensitivity	---	---	---	-20	dBm	5
Maximum Input Power	Pin	-3	---	---	dBm	
Signal Detect -- Asserted	Pa	---	---	-20	dBm	Transition: low to high
Signal Detect -- Deasserted	Pd	-31	---	---	dBm	Transition: high to low
Signal detect -- Hysteresis		1.0	---		dB	
Wavelength of Operation		1260		1360	nm	6
Optical Return Loss	ORL	14			dB	
Electrical						
Differential Output Voltage	$V_{OH} - V_{OL}$	0.6		2.0	V	
Output LOS Voltage -- Low	V_{OL}	0		0.5	V	7
Output LOS Voltage -- High	V_{OH}	2.0		$V_{CC}+0.3$	V	7
Signal Detect Assert Time	AS_{MAX}			100	μs	OFF to ON
Signal Detect Deassert Time	ANS_{MAX}			300	μs	ON to OFF

Notes: 5. Minimum sensitivity and saturation levels at BER 1E-12 for a 2⁷-1 PRBS.

6. At least 30 dB optical isolation for the wavelength 1480 to 1580 nm.

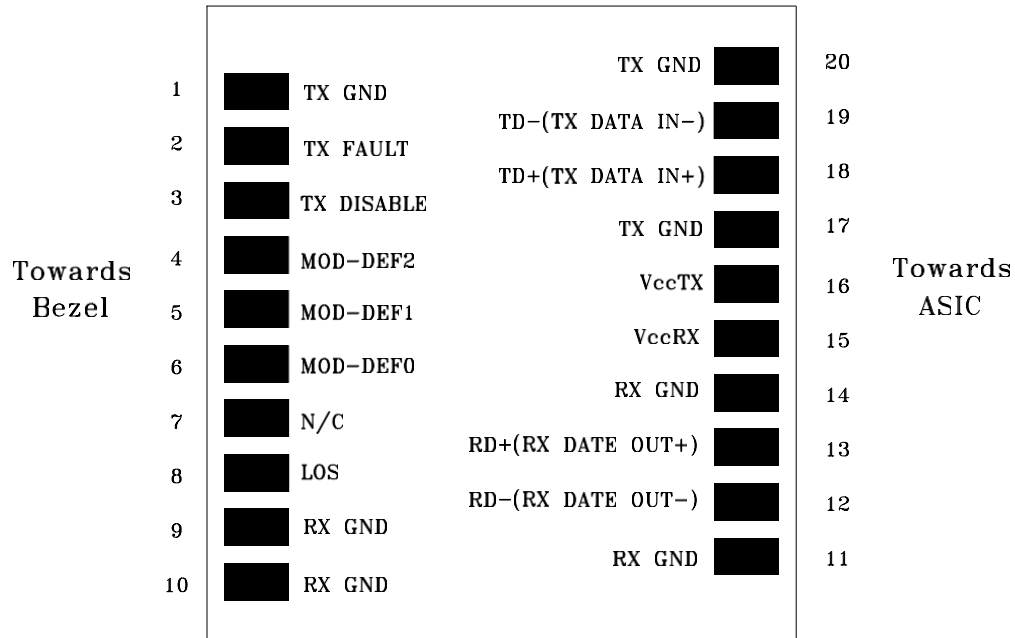
7. Open collector compatible, 4.7K to 10K ohm pull-up to Vcc (Host Supply Voltage).

RECOMMENDED CIRCUIT SCHEMATIC



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CONNECTION DIAGRAM



PIN	Signal Name	Description	PIN	Signal Name	Description
1	TX GND	Transmitter Ground	11	RX GND	Receiver Ground
2	TX Fault	Transmitter Fault Indication	12	RX DATA OUT-	Inverse Receiver Data Out
3	TX Disable	Transmitter Disable (Module disables on high or open)	13	RX DATA OUT+	Receiver Data Out
4	MOD-DFE2	Modulation Definition 2 – Two wires serial ID Interface	14	RX GND	Receiver Ground
5	MOD-DEF1	Modulation Definition 1 – Two wires serial ID Interface	15	Vcc RX	Receiver Power – 3.3V±5%
6	MOD-DEF0	Modulation Definition 0 – Ground in Module	16	Vcc TX	Transmitter Power – 3.3V±5%
7	N/C	Not Connected	17	TX GND	Transmitter Ground
8	LOS	Loss of Signal	18	TX DATA IN+	Transmitter Data In
9	RX GND	Receiver Ground	19	TX DATA IN-	Inverse Transmitter Data In
10	RX GND	Receiver Ground	20	TX GND	Transmitter Ground

Module Definition

Module Definition	MOD-DEF2 PIN 4	MOD-DEF1 PIN 5	MOD-DEF0 PIN 6	Interpretation by Host
4	SDA	SCL	LV-TTL Low	Serial module definition protocol

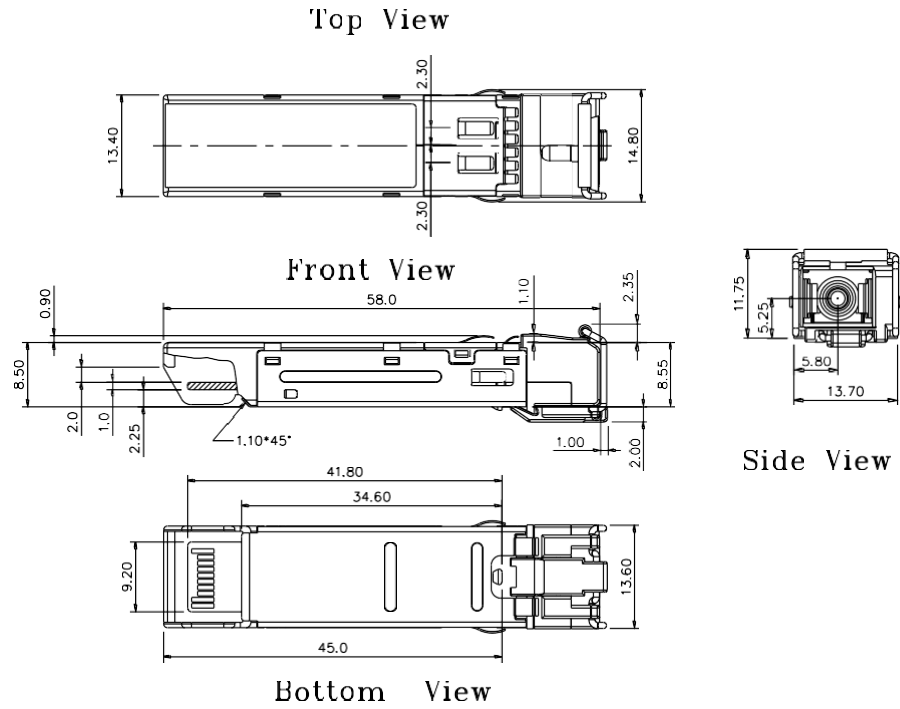
Module Definition 4 specifies a serial definition protocol. For this definition, upon power up, MOD-DEF(1:2) appear as no connector (NC) and MOD-DEF(0) is TTL LOW. When the host system detects this condition, it activates the serial protocol. The protocol uses the 2-wire serial CMOS E²PROM protocol of the ATMEL AT24C01A/02/04 family of components.

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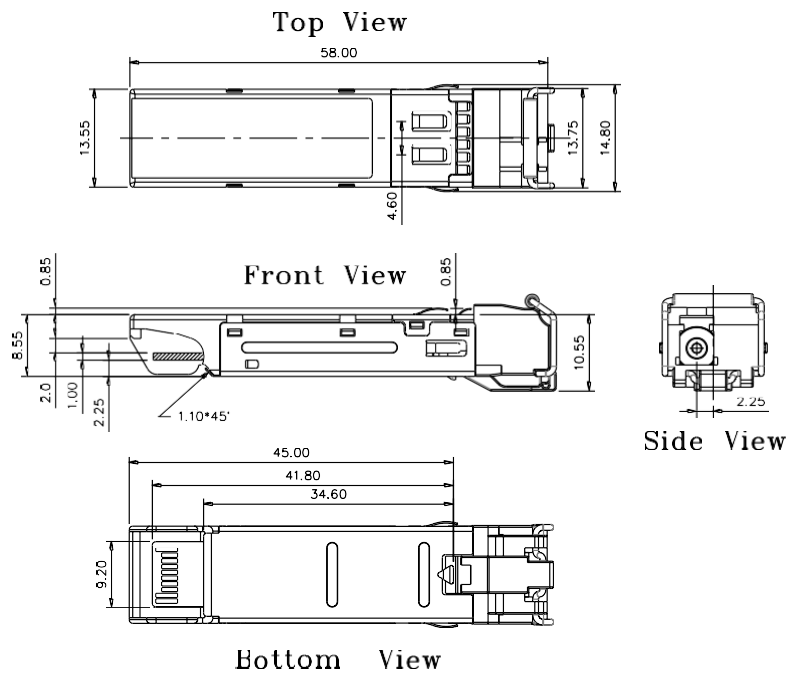
PACKAGE DIAGRAM

Units in mm

A) SC SFP



B) LC SFP



Note: Specifications subject to change without notice.