

Professional high-speed optical transceiver

OPN-SG-01R / OPN-SG-01RI 3.3V / 10/100/1000BASE-T / 1.25 Gbps RoHS Compliant Electrical SFP Transceiver with Integrated RJ-45

PRODUCT FEATURES

- RoHS-6 Compliant (see Table 1)
- Designed for Industry-Standard, Small Form Factor Pluggable (SFP) Ports
 - Compliance with IEEE 802.3:2005
 - Custom RJ-45 connector with integrated magnetics
 - Link lengths at 1.25 Gbd: up to 100 m per IEEE802.3
- Low power, high performance 1.25 Gbd SerDes integrated in module
 - Single +3.3 V power supply operation
- Auto-negotiation per IEEE 802.3:2005 Clause 28 (Twisted Pair) and Clause 37 (1000BASE-X)
 - Compatible to both shielded and unshielded twisted pair category 5 cable
- Available in Commercial Temperature (0~70 °C) and Industrial Temperature (-50~85 °C)
 - 10/100/1000BASE-T operation available with SGMII host systems.

APPLICATIONS

- Switch to switch interface
- Switched backplane applications
 - File server interface

PRODUCT DESCRIPTION

The OPN-SG-01R is a low-power, high-performance electrical SFP transceiver designed for 10/100/1000BASE-T operation over standard twisted-pair cabling. It features a built-in RJ-45 jack with integrated magnetics, enabling direct connection to Category 5 or higher copper cabling without external transformers or PHY components.

The module supports auto-negotiation per IEEE 802.3 Clause 28 and Clause 37 and delivers full-duplex throughput up to 1.25 Gb/s using 5-level PAM (Pulse Amplitude Modulation) signaling. It interfaces with the host system via a standard SerDes differential link and provides a TTL RX_LOS signal to indicate link status.

Fully compliant with the SFP Multi-Source Agreement (MSA), the module is compatible with any standard SFP cage and supports hot-plug operation.

ORDER INFORMATION

P/No.	Speed	Interface	Distance	Voltage	Temp. (°C)	RX_LOS	RoHS
OPN-SG-01R	10/100/1000BASE-T	RJ-45 (Cat 5)	≤ 100 m	3.3 V	0 to +70	Yes	Yes
OPN-SG-01RI	10/100/1000BASE-T	RJ-45 (Cat 5)	≤ 100 m	3.3 V	-50 to +85	Yes	Yes

Absolute Maximum Ratings

Parameter	Symbol	Min	Max	Units	Notes
Storage Temperature	Ts	-50	+85	°C	Note 1
Case Temperature	Tc	-50	+85	°C	Note 1, 2
Relative Humidity	RH	5	95	%	Note 1
Module Supply Voltage	VccT,R	-0.5	3.6	V	Note 1, 2
Data/Control Input Voltage	Vi	-0.5	Vcc	V	Note 1
Sense Output Current - MOD-DEF2			5.0	mA	

Recommended Operating Conditions

Parameter	Symbol	Min	Typ	Max	Units / Notes
Case Temperature	Tc	0		70	°C / Note 3
		-50		85	
Module Supply Voltage	VccT,R	3.135	3.3	3.465	V / Note 3
Data Rate			1.25		Gb/s / Note 3

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Transceiver Electrical Characteristics (T _c = 0°C to +70 °C, V _{ccT,R} = 3.3V ± 5%) (T _c = -50°C to +85°C, V _{ccT,R} = 3.3V +/- 5%)						
Parameter	Symbol	Min	Typ	Max	Units	Notes
AC Electrical Characteristics						
Power Supply Noise Rejection (peak-peak)	PSNR		100		mV	Note 4
DC Electrical Characteristics						
Module supply current (T _c = 0 °C to +70 °C, V _{ccT,R} = 3.3 V ± 5%) (T _c = -50 °C to +85°C, V _{ccT,R} = 3.3 V +/- 5%)	I _{CC}			350 370	mA	
Power Dissipation (T _c = 0 °C to +70 °C, V _{ccT,R} = 3.3 V ± 5%) (T _c = -50 °C to +85°C, V _{ccT,R} = 3.3 V +/- 5%)	P _{DISS}			1100 1150	mW	
Sense Outputs: MOD-DEF2 RX_LOS	V _{OH} V _{OL}	2.0 0		V _{ccT, R} + 0.3 0.4	V	Note 5
Control Inputs: Transmitter Disable(TX_DISABLE), MOD-DEF1, 2	V _{IH} V _{IL}	2.0 0		V _{CC} 0.8	V V	Note 5

Notes:

1. Absolute Maximum Ratings are those values beyond which damage to the device may occur if these limits are exceeded for other than a short period of time. See Reliability Data Sheet for specific reliability performance.
2. Between Absolute Maximum Ratings and the Recommended Operating Conditions functional performance is not intended, device reliability is not implied, and damage to the device may occur over an extended period of time.
3. Operating conditions will vary, depending on model. Recommended Operating Conditions are those values outside of which functional performance is not intended, device reliability is not implied, and damage to the device may occur over an extended period of time. See Reliability Data Sheet for specific reliability performance later when it is ready.
4. MSA-specified filter is required on the host board to achieve PSNR performance over the frequency range 10 Hz to 2 MHz.
5. LVTTTL, external 4.7-10 KΩ pull-Up resistor required for MOD-DEF 1 and MOD-DEF 2.

Transmitter and Receiver Electrical Characteristics (T _c = 0°C to +70°C, V _{ccT,R} = 3.3V ± 5%) (T _c = -50°C to +85°C, V _{ccT,R} = 3.3V +/- 5%)						
Parameter	Symbol	Min	Typ	Max	Units	Notes
Optical						
Data Input: Transmitter Differential Input Voltage (TD +/-)	V _I	330	---	2400	mV	Note 1
Data Output: Receiver Differential Output Voltage (RD +/-)	V _O	370	735	2000	mV	Note 2
Receive Data Rise & Fall Times (Receiver)	T _{rf}	---	100	250	ps	Note 3

Transceiver Timing Characteristics (T _c = 0°C to +70°C, V _{ccT,R} = 3.3V ± 5%) (T _c = -50°C to +85°C, V _{ccT,R} = 3.3V +/- 5%)						
Parameter	Symbol	Min	Typ	Max	Units	Notes
Tx Disable Assert Time	t _{off}			NA		Note 4
Tx Disable Negate Time	t _{on}			NA		Note 4
Module Reset Assert Time	t _{off_rst}			10	μs	Note 5
Module Reset Negate Time	t _{on_rst}			30	ms	Note 6
Time to initialize	t _{init}			300	ms	
Tx Fault Assert Time	t _{fault}			NA		Note 7
Tx Disable to Reset	t _{reset}			NA		Note 7
LOS Assert Time	t _{loss_on}			NA		Note 7
LOS De-assert Time	t _{loss_off}			NA		Note 7
Rate Select Change Time	t _{ratesel}			NA		Note 7
Serial ID Clock Rate	F _{serial_clock}			100	kHz	

Notes:

1. Internally ac coupled and terminated (100 Ohm differential). These levels are compatible with CML and LVPECL voltage swings.
2. Internally ac coupled with an external 100 ohm differential load termination.
3. 20%-80% rise and fall times measured with a 500 MHz signal utilizing a 1010 pattern.
4. Tx Disable function as described in the SFP MSA is not used in the 1000BASE-T module.

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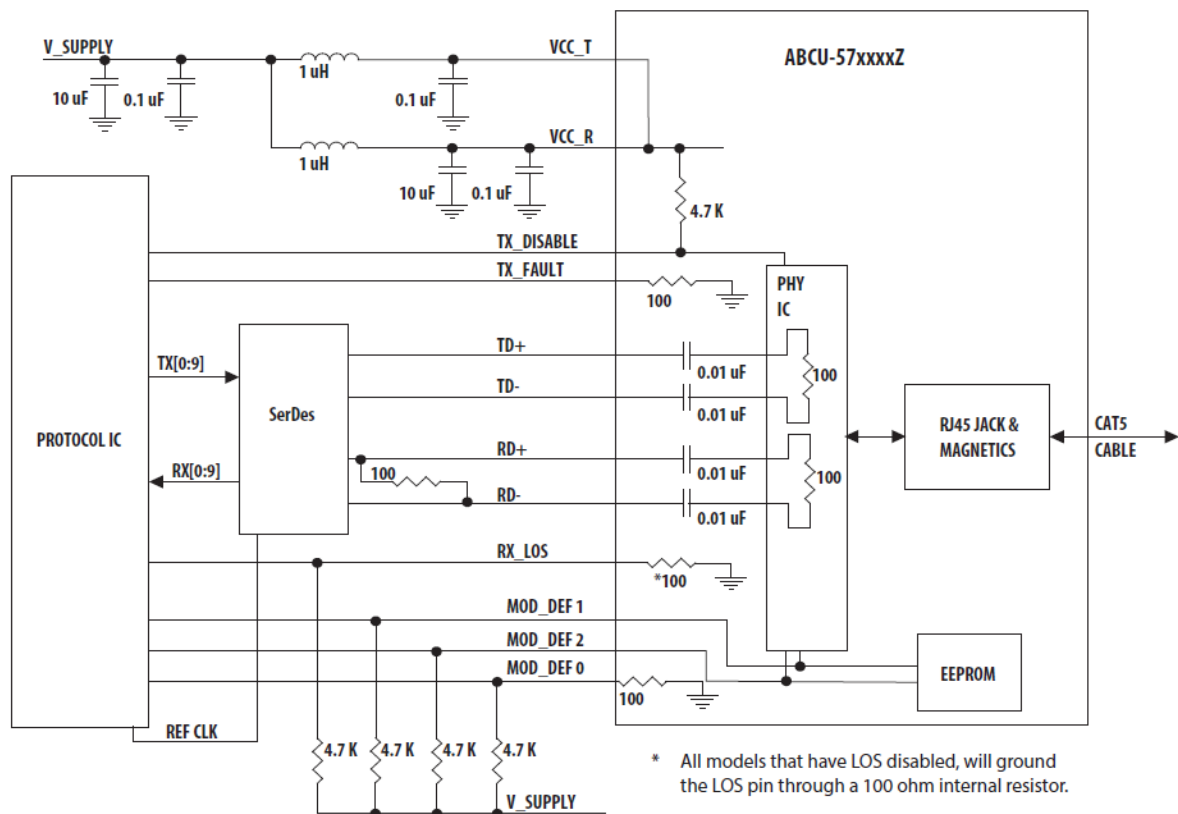
5. Time from rising edge of Tx Disable until link comes down.
6. Time from falling edge of Tx Disable until auto-negotiation starts.
7. Not used in the 1000BASE-T module

20-PIN CONNECTION DIAGRAM DESCRIPTION

PIN	Signal Name	Description	PIN	Signal Name	Description
1	VEET	Transmitter Ground	11	VEER	Receiver Ground
2	N/C	Not Connected	12	RD-	Receiver Data Out (Inverted)
3	TX_DISABLE	Transmitter Disable / Reset	13	RD+	Receiver Data Out
4	MOD_DEF2	Serial ID Data (SFP MSA)	14	VEER	Receiver Ground
5	MOD_DEF1	Serial ID Clock (SFP MSA)	15	VCCR	Receiver Power (+3.3 V)
6	MOD_DEF0	Ground (Module Present)	16	VCCT	Transmitter Power (+3.3 V)
7	N/C	Not Connected	17	VEET	Transmitter Ground
8	LOS	RX_LOS (TTL, active high)	18	TD+	Transmitter Data In
9	VEER	Receiver Ground	19	TD-	Transmitter Data In (Inverted)
10	VEER	Receiver Ground	20	VEET	Transmitter Ground

1. LOS = RX_LOS for OPN-SG-01R models.
2. TX_DISABLE acts as a reset pin (high = reset)

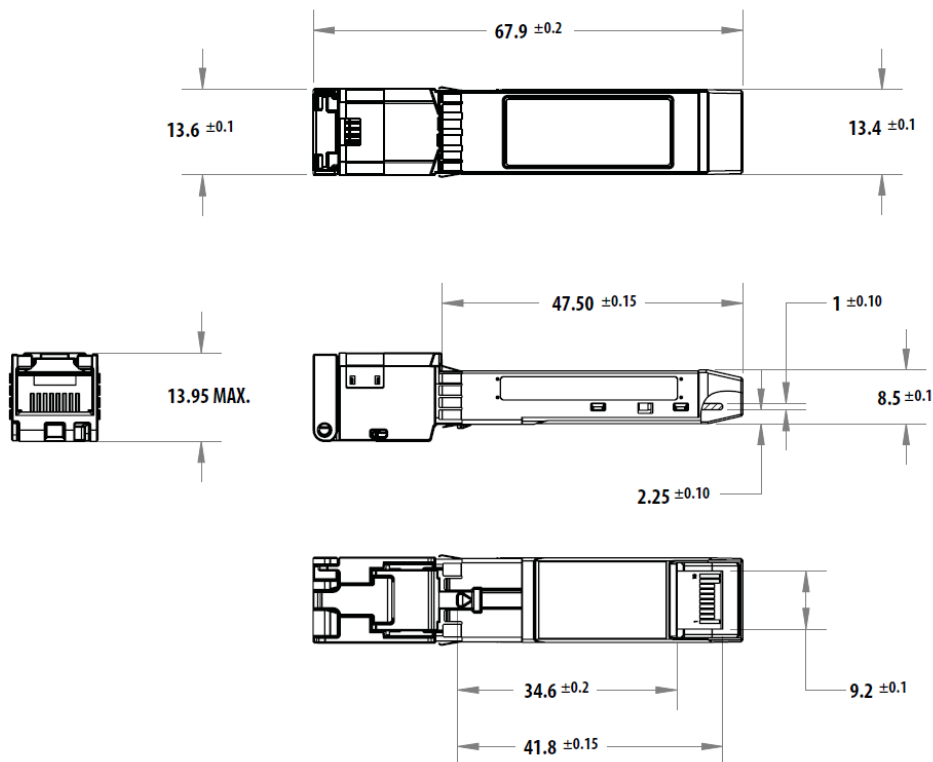
RECOMMENDED CIRCUIT SCHEMATIC



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PACKAGE DIAGRAM

Units in mm



Note: Specifications subject to change without notice.