

Professional high-speed optical transceiver

OPN-S8G13-40SC / OPN-S8G13-40SCI
OPN-S8G13-40SC-EMG / OPN-S8G13-40SCI-EMG
OPN-S8G13T-40SC-EMG / OPN-S8G13T-40SCI-EMG
OPN-S8G13-40ST / OPN-S8G13-40STI
OPN-S8G13T-40ST / OPN-S8G13T-40STI
OPN-S8G13-40FC / OPN-S8G13-40FCI
OPN-S8G13T-40FC / OPN-S8G13T-40FCI

3.3V / 1310 nm / 1.25 Gbps RoHS Compliant Optical Single-Mode Transceiver

PRODUCT FEATURES

- Duplex SC Single Mode Transceiver: OPN-S8G13-40SC
- Duplex ST Single Mode Transceiver: OPN-S8G13-40ST
- Duplex FC Single Mode Transceiver: OPN-S8G13-40FC
 - Compliant with IEEE 802.3z Gigabit Ethernet
 - Link Distance up to 40 km
 - Link Power Budget at Least 22 dB
 - Industry Standard 1 x 9 Footprint
 - Single +3.3 V Power Supply
 - RoHS Compliant
 - 0 to 70°C Operating: OPN-S8G13-40ST
 - -50 to 85°C Operating: OPN-S8G13-40STI
- LVPECL Signal Detect Output: OPN-S8G13-40STI
- LVTTTL Signal Detect Output: OPN-S8G13T-40STI
 - Wave Solderable
- Class 1 Laser International Safety Standard IEC 60825Compliant

APPLICATIONS

- Switch to Switch Interface
- High Speed Interface for File Servers
- High Performance Desktops

PRODUCT DESCRIPTION

The OPN-S8G13-40STI series single mode transceiver is a low power, high performance module for bi-directional serial optical data communications such Gigabit Ethernet and Fibre Channel. This module is designed for single mode fiber and operates at a nominal wavelength of 1310 nm. The transmitter section uses a multiple quantum well laser and is a class 1 laser compliant according to International Safety Standard IEC 60825. The receiver section uses an integrated InGaAs detector preamplifier (IDP) mounted in an optical header and a limiting post-amplifier IC. A PECL logic interface simplifies interface to external circuitry.

ORDER INFORMATION

P/No.	Bit Rate (Mb/s)	1000 BASE	Distance (km)	Wavelength (nm)	Voltage (V)	Package	Temp. (°C)	TX Power (dBm)	RX Sens. (dBm)	RoHS Compliance
OPN-S8G13-40ST	1250		40	1310 DFB	3.3	1X9 SC/ST/FC	0 to 70	3 to -2	-24	Y
OPN-S8G13-40STI	1250		40	1310 DFB	3.3	1X9 SC/ST/FC	-50 to 85	3 to -2	-24	Y

Absolute Maximum Ratings

Parameter	Symbol	Min	Max	Units	Notes
Storage Temperature	Tstg	-50	85	°C	
Operating Temperature	Topr	0 -50	70 85	°C	OPN-S8G13-40ST OPN-S8G13-40STI
Soldering Temperature	---		260	°C	10 seconds on leads only

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Power Supply Voltage	Vcc	0	4.5	V	
Input Voltage	---	GND	Vcc	V	
Output Current	Iout	0	30	mA	

Recommended Operating Conditions					
Parameter	Symbol	Min	Typ	Max	Units
Power Supply Voltage	Vcc	3.1	3.3	3.5	V
Operating Temperature	Topr	0 -50		70 85	°C / OPN-S8G13-40ST °C / OPN-S8G13-40STI
Data Rate			1250	1300	Mb/s
Power Supply Current	Icc		180	260	mA

Transmitter Specifications (0°C < Topr < 70°C, 3.1V < Vcc < 3.5V)						
Parameter	Symbol	Min	Typ	Max	Units	Notes
Optical						
Optical Transmit Power	Po	-2	---	3	dBm	1
Output Center Wavelength	λ	1261	1310	1360	Nm	
Output Spectrum Width	$\Delta\lambda$	---		1	Nm	-20 dB width
Side Mode Suppression Ratio	SMSR	30			dB	
Extinction Ratio	ER	9	---	---	dB	
Output Eye	Compliant with IEEE 802.3z					
Optical Rise Time	tr			0.26	ns	20% to 80% Values
Optical Fall Time	tf			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	IIL	-350			μA	
Data Input Current – High	IiH			350	μA	
Differential Input Voltage	V _{IH} - V _{IL}	300			mV	
Data Input Voltage – Low	V _{IL} - V _{CC}	-2.0		-1.58	V	3
Data Input Voltage -- High	V _{IH} - V _{CC}	-1.1		-0.74	V	3

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

2. Measured with a 2⁷-1 PRBS.

3. These inputs are compatible with 10K, 10KH and 100K ECL and LVPECL inputs.

Receiver Specifications (0°C < Topr < 70°C, 3.1V < Vcc < 3.5V)						
Parameter	Symbol	Min	Typ	Max	Units	Notes
Optical						
Sensitivity	---	---	---	-24	dBm	1
Maximum Input Power	Pin	-3		---	dBm	
Signal Detect -- Asserted	Pa	---	---	-24	dBm	Transition: low to high
Signal Detect -- Deasserted	Pd	-36	---	---	dBm	Transition: high to low
Signal detect -- Hysteresis		1.0	---		dB	
Wavelength of Operation		1100	---	1600	nm	
Electrical						
Data Output Voltage – Low	V _{OL} - V _{CC}	-2.0		-1.58	V	2
Data Output Voltage – High	V _{OH} - V _{CC}	-1.1		-0.74	V	2
Signal Detect Output Voltage -- Low	V _{OL} - V _{CC}	-2.0		-1.58	V	OPN-S8G13-40STI
Signal Detect Output Voltage -- High	V _{OH} - V _{CC}	-1.1		-0.74	V	
Signal Detect Output Voltage -- Low	V _{SDL}			0.5	V	OPN-S8G13T-40STI
Signal Detect Output Voltage -- High	V _{SDH}	2.0			V	

Notes: 1. Minimum sensitivity and saturation levels at BER=1E-12 for a 2⁷-1 PRBS at ER=9 dB.

2. These outputs are compatible with 10K, 10KH and 100K ECL and PECL outputs.

CONNECTION DIAGRAM

Receiver Signal Ground	1 (Rx GND)	
Receiver Data Out	2 (RD+)	N/C
Receiver Data Out Bar	3 (RD-)	
Signal Detect	4 (SD)	
Receiver Power Supply	5 (Rx Vcc)	
Transmitter Power Supply	6 (Tx Vcc)	
Transmitter Data In Bar	7 (TD-)	
Transmitter Data In	8 (TD+)	N/C
Transmitter Signal Ground	9 (Tx GND)	

PIN	Symbol	Notes
1	Rx GND	Directly connect this pin to the receiver ground plane
2	RD+	See recommended circuit schematic
3	RD-	See recommended circuit schematic
4	SD	Active high on this indicates a received optical signal
5	Rx V _{CC}	+3.3V dc power for the receiver section
6	Tx V _{CC}	+3.3V dc power for the transmitter section
7	TD-	See recommended circuit schematic
8	TD+	See recommended circuit schematic
9	Tx GND	Directly connect this pin to the transmitter ground plane

The schematic diagram illustrates the internal structure of a SerDes IC, divided into two main functional blocks: the Transceiver and the SerDes IC.

Transceiver Block:

- TX Path:** Includes an LD Driver connected to pins 8 (ID+) and 7 (ID-). It features a 100Ω resistor and 0.1 nF capacitors for impedance matching. Pin 9 is TX GND.
- RX Path:** Includes an RX Amp connected to pins 3 (ID+) and 2 (ID-). It features a 150Ω resistor and 0.1 nF capacitors for impedance matching. Pin 1 is RX GND.
- Control and Biasing:** Pin 6 (TX Vcc) and Pin 5 (RX Vcc) are connected to a 3.3V supply through 1 nH inductors. Biasing is provided by 10 nA current sources and 10 nF capacitors. Pin 4 (SD) is connected to a 3.3V supply through inductors L1 and L2, with a signal level indicator.

SerDes IC Block:

- TX Path:** The TX ID+ and TX ID- signals are connected to the SerDes IC's TX ID+ and TX ID- pins, which are terminated with 20Ω resistors.
- RX Path:** The RX ID+ and RX ID- signals are connected to the SerDes IC's RX ID+ and RX ID- pins, which are also terminated with 20Ω resistors. A feedback resistor R7 is connected between the RX ID+ and RX ID- pins.
- Control and Biasing:** The SerDes IC is powered by a 3.3V supply. It includes LVPECL drivers for the TX ID+ and TX ID- signals and an LVPECL receiver for the RX ID+ and RX ID- signals.

The diagram shows the electrical connections and component values for the Transceiver and SerDes IC blocks, including the TX and RX paths, control signals, and power/biasing connections.

For PECL SD Level, R1=130 ohm, R2=82 ohm, R7=100 ohm

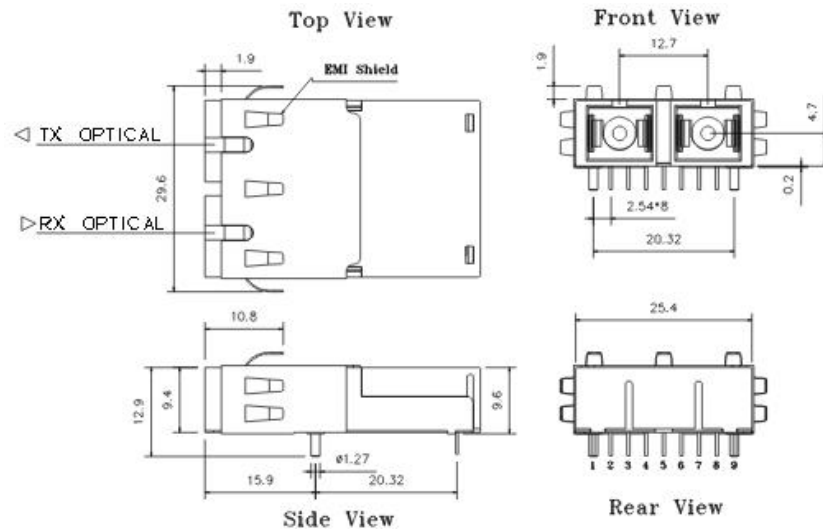
The split-load terminations for ECL signals need to be located at the input of devices receiving those ECL signals. The power supply filtering is required for good EMI performance. Use short tracks from the inductor L1/L2 to the module Rx Vcc and Tx Vcc. A GND plane under the module is required for good EMI and sensitivity performance.

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PACKAGE DIAGRAM

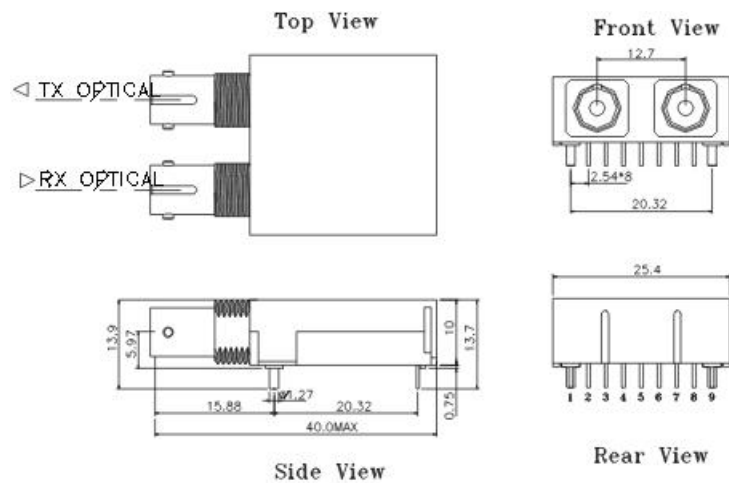
Units in mm

1) SC Type With Extended Shielding



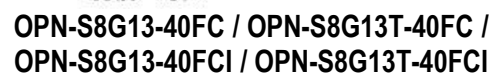
OPN-S8G13-40SC-EMG / OPN-S8G13T-40SC-EMG /
OPN-S8G13-40SCI-EMG / OPN-S8G13T-40SCT-EMG

2) ST Type



OPN-S8G13-40ST / OPN-S8G13T-40ST /
OPN-S8G13-40STI / OPN-S8G13T-40STI

3) FC Type



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