

## Professional high-speed optical transceiver

**OPN-S8G15-160SC / OPN-S8G15-160SCI**  
**OPN-S8G15-160SC-EMG / OPN-S8G15-160SCI-EMG**  
**OPN-S8G15-160ST / OPN-S8G15-160STI**  
**OPN-S8G15-160FC / OPN-S8G15-160FCI**  
**OPN-S8G15T-160SC / OPN-S8G15T-160SCI**  
**OPN-S8G15T-160SC-EMG / OPN-S8G15T-160SCI-EMG**  
**OPN-S8G15T-160ST / OPN-S8G15T-160STI**  
**OPN-S8G15T-160FC / OPN-S8G15-160FCI**

**3.3V / 1550 nm / 1.25 Gbps RoHS Compliant Optical Single-Mode Transceiver**

## PRODUCT FEATURES

- Duplex SC Single Mode Transceiver: OPN-S8G15-160SC
- Duplex ST Single Mode Transceiver: OPN-S8G15-160ST
- Duplex FC Single Mode Transceiver: OPN-S8G15-160FC
  - Compliant with IEEE 802.3z Gigabit Ethernet
    - 1550 nm DFB LD Transmitter
    - High Sensitivity APD Receiver
    - 36 dB Power Budget At Least
      - Distance up to 160 km
  - 0 to 70°C Operation: OPN-S8G15T-160FC
  - -50 to 85°C Operation: OPN-S8G15T-160FCI
    - Industry Standard 1 x 9 Footprint
    - Single +3.3 V Power Supply
      - RoHS Compliant
  - LVPECL Signal Detect Output: OPN-S8G15-160FC
  - LVTTTL Signal Detect Output: OPN-S8G15T-160FC
    - 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-S8G15T-160FC 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 1550 nm. Aguaranteed minimum optical link budget of 36 dB is offered which can correspond to a link distance of over 160 km (assuming worst case fiber loss of 0.20 dB/km). The transmitter section uses a multiple quantum well laser and isa class 1 laser compliant according to International SafetyStandard IEC-60825. The receiver section uses anintegrated InGaAs Avalanche photodetector 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<br>(Mb/s) | IEEE<br>802.3z | Distance<br>(km) | Wavelength<br>(nm) | Voltage<br>(V) | Package      | Temp.<br>(°C) | TX<br>Power<br>(dBm) | RX<br>Sens.<br>(dBm) | RoHS<br>Complia<br>nt |
|-------------------|--------------------|----------------|------------------|--------------------|----------------|--------------|---------------|----------------------|----------------------|-----------------------|
| OPN-S8G15T-160FC  | 1250               | EZX            | 160              | 1550 DFB           | 3.3            | 1X9 SC/ST/FC | 0 to 70       | 5 to 2               | -34                  | Yes                   |
| OPN-S8G15T-160FCI | 1250               | EZX            | 160              | 1550 DFB           | 3.3            | 1X9 SC/ST/FC | -50 to 85     | 5 to 2               | -34                  | Yes                   |

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| Absolute Maximum Ratings |        |          |          |       |                                       |
|--------------------------|--------|----------|----------|-------|---------------------------------------|
| Parameter                | Symbol | Min      | Max      | Units | Notes                                 |
| Storage Temperature      | Tstg   | -50      | 85       | °C    |                                       |
| Operating Temperature    | Topr   | 0<br>-50 | 70<br>85 | °C    | OPN-S8G15T-160FC<br>OPN-S8G15T-160FCI |
| Soldering Temperature    | ---    |          | 260      | °C    | 10 seconds on leads only              |
| 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    | 3.13     | 3.3  | 3.47     | V                                               |
| Operating Temperature            | Topr   | 0<br>-50 |      | 70<br>85 | °C / OPN-S8G15T-160FC<br>°C / OPN-S8G15T-160FCI |
| Data Rate                        |        |          | 1250 | 1300     | Mb/s                                            |
| Power Supply Current             | Icc    |          |      | 280      | mA                                              |

| Transmitter Specifications (0°C < Topr < 70°C, 3.13V < Vcc < 3.47V) |                                   |      |      |       |       |                   |
|---------------------------------------------------------------------|-----------------------------------|------|------|-------|-------|-------------------|
| Parameter                                                           | Symbol                            | Min  | Typ  | Max   | Units | Notes             |
| <b>Optical</b>                                                      |                                   |      |      |       |       |                   |
| Optical Transmit Power                                              | Po                                | 2    | ---  | 5     | dBm   | 1                 |
| Output Center Wavelength                                            | $\lambda$                         | 1500 | 1550 | 1580  | 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                 |
| <b>Electrical</b>                                                   |                                   |      |      |       |       |                   |
| Data Input Current – Low                                            | IL                                | -350 |      |       | μA    |                   |
| Data Input Current – High                                           | I <sub>IH</sub>                   |      |      | 350   | μA    |                   |
| Differential Input Voltage                                          | V <sub>IH</sub> - V <sub>IL</sub> | 300  |      |       | mV    |                   |
| Data Input Voltage – Low                                            | V <sub>IL</sub> - V <sub>CC</sub> | -2.0 |      | -1.58 | V     | 3                 |
| Data Input Voltage -- High                                          | V <sub>IH</sub> - V <sub>CC</sub> | -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 2<sup>7</sup>-1 PRBS.

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

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| Receiver Specifications (0°C < Topr < 70°C, 3.13V < Vcc < 3.47V) |                                   |      |     |       |       |                         |
|------------------------------------------------------------------|-----------------------------------|------|-----|-------|-------|-------------------------|
| Parameter                                                        | Symbol                            | Min  | Typ | Max   | Units | Notes                   |
| <b>Optical</b>                                                   |                                   |      |     |       |       |                         |
| Sensitivity                                                      | ---                               | ---  | --- | -34   | dBm   | 1                       |
| Maximum Input Power                                              | Pin                               | -9   |     | ---   | dBm   |                         |
| Signal Detect -- Asserted                                        | Pa                                | ---  | --- | -34   | dBm   | Transition: low to high |
| Signal Detect -- Deasserted                                      | Pd                                | -43  | --- | ---   | dBm   | Transition: high to low |
| Signal detect -- Hysteresis                                      |                                   | 1.0  | --- |       | dB    |                         |
| Wavelength of Operation                                          |                                   | 1100 | --- | 1600  | nm    |                         |
| <b>Electrical</b>                                                |                                   |      |     |       |       |                         |
| Data Output Voltage – Low                                        | V <sub>OL</sub> - V <sub>CC</sub> | -2.0 |     | -1.58 | V     | 2                       |
| Data Output Voltage – High                                       | V <sub>OH</sub> - V <sub>CC</sub> | -1.1 |     | -0.74 | V     | 2                       |
| Signal Detect Output Voltage -- Low                              | V <sub>OL</sub> - V <sub>CC</sub> | -2.0 |     | -1.58 | V     | OPN-S8G15-160FC         |
| Signal Detect Output Voltage -- High                             | V <sub>OH</sub> - V <sub>CC</sub> | -1.1 |     | -0.74 | V     |                         |
| Signal Detect Output Voltage -- Low                              | V <sub>SDL</sub>                  |      |     | 0.5   | V     | OPN-S8G15T-160FC        |
| Signal Detect Output Voltage -- High                             | V <sub>SDH</sub>                  | 2.0  |     |       | V     |                         |

Notes: 1. Minimum sensitivity and saturation levels at BER=1E-12 for a 2<sup>7</sup>-1 PRBS at ER=9 dB.

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

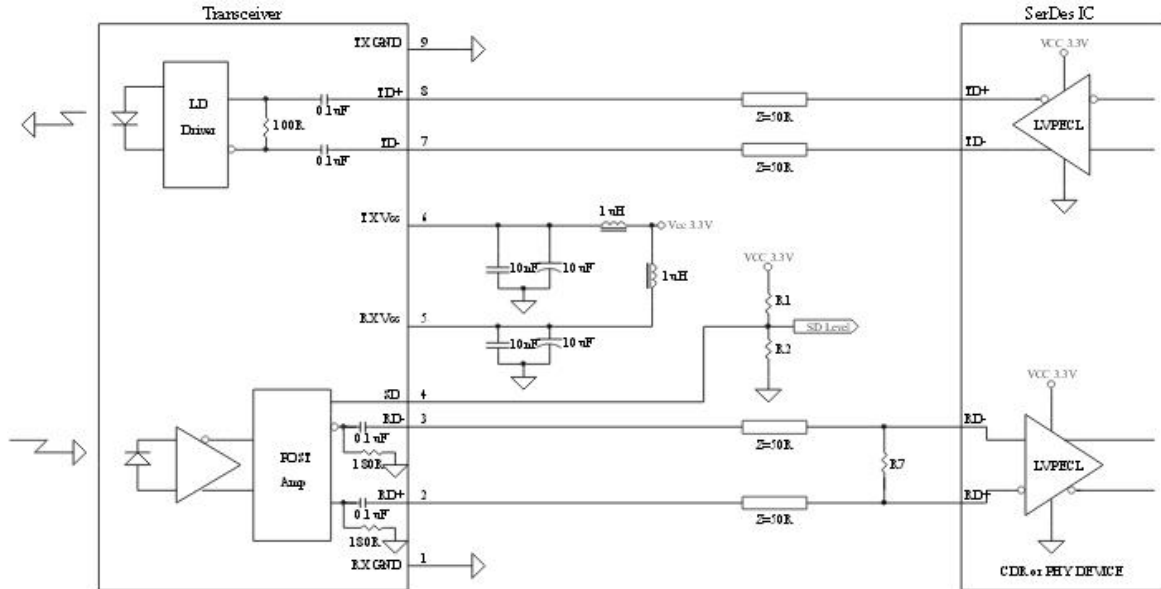
## CONNECTION DIAGRAM

|                           |            |          |     |
|---------------------------|------------|----------|-----|
| 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) | TOP VIEW |     |
| 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 Vcc | +3.3V dc power for the receiver section                   |
| 6   | Tx Vcc | +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 |

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### RECOMMENDED CIRCUIT SCHEMATIC



For TTL SD Level, R1=R2=N.C., R7=100 ohm

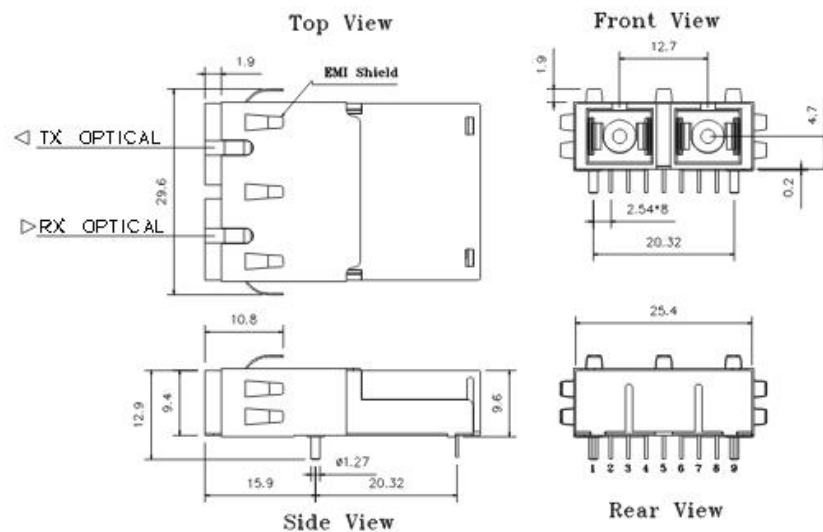
For PECL SD Level, R1=130 ohm, R2=82 ohm, R7=100 ohm

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.

### PACKAGE DIAGRAM

Units in mm

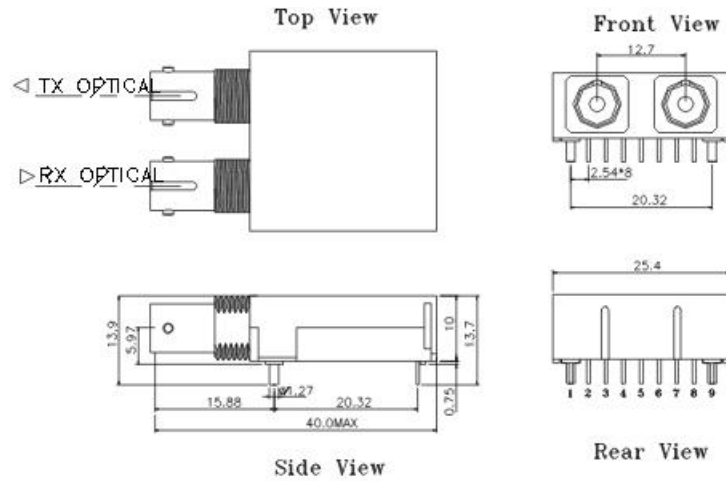
#### 1) SC Type with Extended Shielding



OPN-S8G15-160SC-EMG / OPN-S8G15T-160SC-EMG

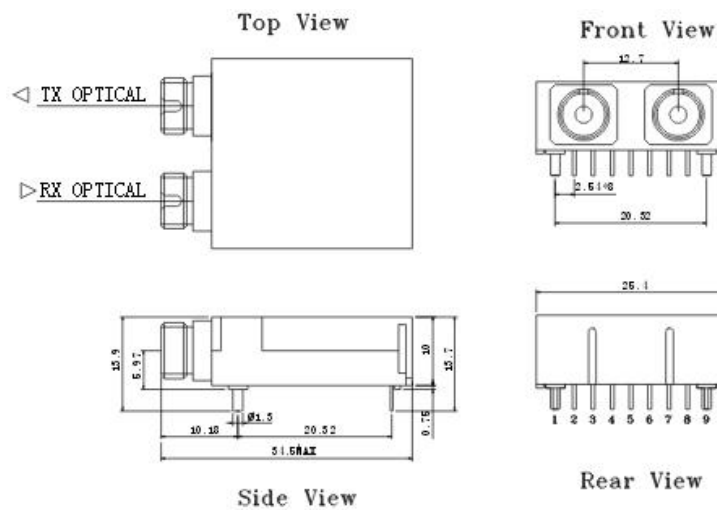
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### 2) ST Type



### OPN-S8G15-160ST / OPN-S8G15T-160ST

### 3) FC Type



### OPN-S8G15-160FC / OPN-S8G15T-160FC

**Note:** Specifications subject to change without notice.