Singlemode 155Mbps 1310nm Bi-Directional
Single Fiber Optical Transceiver

**Features**
- Single fiber and single 1310nm wavelength
- Industrial standard 1 x 9 pin footprint
- Receiver signal detect function
- Wide dynamic range receiver with AGC
- PECL/LVPECL logic interface, DC or AC coupling
- Single supply 5V/3.3V
- Low power consumption

**Specifications**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Transmitter</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Data Rate (NRZ)</td>
<td>B</td>
<td>10</td>
<td>155</td>
<td>250</td>
<td>Mb/s</td>
</tr>
<tr>
<td>Optical Output Power (avg.)</td>
<td>Po</td>
<td>-15</td>
<td>-</td>
<td>-8</td>
<td>dBm</td>
</tr>
<tr>
<td></td>
<td>Po</td>
<td>-8</td>
<td>-</td>
<td>-3</td>
<td>dBm</td>
</tr>
<tr>
<td></td>
<td>Po</td>
<td>-3</td>
<td>-</td>
<td>0</td>
<td>dBm</td>
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<tr>
<td>Extinction Ratio</td>
<td>ER</td>
<td>8.3</td>
<td>-</td>
<td>-</td>
<td>dB</td>
</tr>
<tr>
<td>Optical Wavelength</td>
<td>λC</td>
<td>1260</td>
<td>1310</td>
<td>1360</td>
<td>nm</td>
</tr>
<tr>
<td>Spectral Width</td>
<td>Δλ</td>
<td>-</td>
<td>1.0</td>
<td>2.5</td>
<td>nm</td>
</tr>
<tr>
<td>Output Rise Time (10-90%)</td>
<td>tr</td>
<td>-</td>
<td>0.4</td>
<td>1.0</td>
<td>ns</td>
</tr>
<tr>
<td>Output Fall Time (10-90%)</td>
<td>tf</td>
<td>-</td>
<td>1.0</td>
<td>1.5</td>
<td>ns</td>
</tr>
<tr>
<td>Data Input (6)</td>
<td>VIL</td>
<td>-1.810</td>
<td>VCC</td>
<td>-</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td>VIH</td>
<td>-1.165</td>
<td>VCC</td>
<td>-</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-</td>
<td>-</td>
<td>VCC -1.475</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-</td>
<td>-</td>
<td>VCC -0.880</td>
<td>V</td>
</tr>
<tr>
<td>Supply Voltage</td>
<td>VCC</td>
<td>4.75</td>
<td>5.0</td>
<td>5.25</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3.10</td>
<td>3.3</td>
<td>3.50</td>
<td>V</td>
</tr>
<tr>
<td>Supply Current</td>
<td>ICC</td>
<td>-</td>
<td>-</td>
<td>110</td>
<td>mA</td>
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</table>
### Singlemode 155Mbps 1310nm Bi-Directional Single Fiber Optical Transceiver

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
<th>Unit</th>
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<tbody>
<tr>
<td>Receiver</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Data Rate (NRZ)</td>
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<td>10</td>
<td>155</td>
<td>250</td>
<td>Mb/s</td>
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<tr>
<td>Optical Input Sensitivity (avg.)</td>
<td>P_{IN}</td>
<td>-</td>
<td>-</td>
<td>-19</td>
<td>dBm</td>
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<tr>
<td>Saturation</td>
<td>P_{SAT}</td>
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<td>0</td>
<td>-</td>
<td>dBm</td>
</tr>
<tr>
<td>Optical Wavelength</td>
<td>\lambda</td>
<td>1260</td>
<td>1310</td>
<td>1360</td>
<td>nm</td>
</tr>
<tr>
<td>Output Rise Time (10-90%)</td>
<td>t_r</td>
<td>-</td>
<td>1.5</td>
<td>2.5</td>
<td>ns</td>
</tr>
<tr>
<td>Output Fall Time (10-90%)</td>
<td>t_f</td>
<td>-</td>
<td>1.5</td>
<td>2.5</td>
<td>ns</td>
</tr>
<tr>
<td><strong>Data Output</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>DC Coupled</td>
<td>V_{OL}</td>
<td></td>
<td>V_{CC}</td>
<td>1.840</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td>V_{OH}</td>
<td></td>
<td>V_{CC}</td>
<td>-1.045</td>
<td>V</td>
</tr>
<tr>
<td>AC Coupled (Differential)</td>
<td>V_l</td>
<td>0.6</td>
<td>-</td>
<td>1.8</td>
<td>V</td>
</tr>
<tr>
<td>Signal Detect Asserted (avg.)</td>
<td>P_A</td>
<td>-</td>
<td>-</td>
<td>-28</td>
<td>dBm</td>
</tr>
<tr>
<td>Signal Detect Deasserted (avg.)</td>
<td>P_D</td>
<td>-42</td>
<td>-</td>
<td>-</td>
<td>dBm</td>
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<tr>
<td>Hysteresis</td>
<td>P_{HYS}</td>
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<td>3</td>
<td>-</td>
<td>dB</td>
</tr>
<tr>
<td>Supply Voltage</td>
<td>V_{CC}</td>
<td>3.10</td>
<td>3.3</td>
<td>3.50</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4.75</td>
<td>5.0</td>
<td>5.25</td>
<td>V</td>
</tr>
<tr>
<td>Supply Current</td>
<td>I_{CC}</td>
<td>-</td>
<td>-</td>
<td>100</td>
<td>mA</td>
</tr>
<tr>
<td>Optical Return Loss</td>
<td>RL</td>
<td>50</td>
<td>-</td>
<td>-</td>
<td>dB</td>
</tr>
<tr>
<td>Optical Cross Talk</td>
<td>CL</td>
<td>35</td>
<td>-</td>
<td>-</td>
<td>dB</td>
</tr>
</tbody>
</table>

**Note:**

1. With 0.275 NA, 9/125 \( \mu \)m fiber.
2. Driven with a differential signal.
3. Class 1 eye safe per FDA and IEC.
4. Eye mask diagram is compliant to ITU-T G.957 Eye Diagram.
5. \( 2^{23-1} \) PRBS, BER= \( 10^{-10} \)
6. Compatible with PECL and LVPECL logic levels.
7. The transmitter output should not be viewed directly.

### Absolute Maximum Ratings

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Min.</th>
<th>Max.</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Temperature</td>
<td>-1</td>
<td>0</td>
<td>70 °C</td>
</tr>
<tr>
<td></td>
<td>-2</td>
<td>-40</td>
<td>85 °C</td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>-40</td>
<td>100</td>
<td>°C</td>
</tr>
<tr>
<td>Lead Soldering Limits</td>
<td>-</td>
<td>240/10</td>
<td>°C /sec</td>
</tr>
<tr>
<td>Supply Voltage</td>
<td>5V</td>
<td>-0.2</td>
<td>7 V</td>
</tr>
<tr>
<td></td>
<td>3.3V</td>
<td>-0.2</td>
<td>4 V</td>
</tr>
</tbody>
</table>

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Ordering Information

- Operating Temperature Range:
  1: 0 ~ 70°C
  2: -40 ~ 85°C

- Data Coupling & SD Output Level:

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Tx Coupling</th>
<th>Rx Coupling</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>AC</td>
<td>DC</td>
<td>PECL</td>
</tr>
<tr>
<td>D</td>
<td>AC</td>
<td>DC</td>
<td>TTL</td>
</tr>
<tr>
<td>E</td>
<td>AC</td>
<td>AC</td>
<td>PECL</td>
</tr>
<tr>
<td>F</td>
<td>AC</td>
<td>AC</td>
<td>TTL</td>
</tr>
<tr>
<td>G</td>
<td>DC</td>
<td>DC</td>
<td>PECL</td>
</tr>
<tr>
<td>H</td>
<td>DC</td>
<td>DC</td>
<td>TTL</td>
</tr>
<tr>
<td>I</td>
<td>DC</td>
<td>AC</td>
<td>PECL</td>
</tr>
<tr>
<td>J</td>
<td>DC</td>
<td>AC</td>
<td>TTL</td>
</tr>
</tbody>
</table>

- Supply Voltage:
  5: 5V
  3: 3.3V

- Connector Type:
  SC: SC Connector
  FC: FC Connector
  ST: ST Connector

- Package Type:
  P: Pigtail (fiber length = 100cm)
  R: Receptacle

- Sensitivity Grade:
  (refer to Specifications)
  1: -1
  2: -2

- Tx Output Power Grade:
  (refer to Specifications)
  1: -1
  2: -2
  3: -3

- Receiver Wavelength / Laser Type:
  13: 1310nm (FP LD)
  15: 1550nm (FP LD)
  31: 1310nm (DFB LD)
  55: 1550nm (DFB LD)

- Transmitter Wavelength / Laser Type:
  13: 1310nm (FP LD)
  15: 1550nm (FP LD)
  31: 1310nm (DFB LD)
  55: 1550nm (DFB LD)
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Pinout Description

<table>
<thead>
<tr>
<th>Pin No.</th>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>V_{EER}</td>
<td>Receiver Ground</td>
</tr>
<tr>
<td>2</td>
<td>RD+</td>
<td>Receiver Data Out</td>
</tr>
<tr>
<td>3</td>
<td>RD-</td>
<td>Receiver Data Out (Inverted)</td>
</tr>
<tr>
<td>4</td>
<td>SD</td>
<td>Receiver Signal Detect</td>
</tr>
<tr>
<td>5</td>
<td>V_{CCR}</td>
<td>Receiver Power Supply (5V/3.3V)</td>
</tr>
<tr>
<td>6</td>
<td>V_{CCT}</td>
<td>Transmitter Power Supply (5V/3.3V)</td>
</tr>
<tr>
<td>7</td>
<td>TD-</td>
<td>Transmitter Data In (Inverted)</td>
</tr>
<tr>
<td>8</td>
<td>TD+</td>
<td>Transmitter Data in</td>
</tr>
<tr>
<td>9</td>
<td>V_{EET}</td>
<td>Transmitter Ground</td>
</tr>
</tbody>
</table>

UNIT : mm
Application Notes

Recommended AC Coupling Interface Circuit:

L1=L2=1μH or ferrite bead
C1=C2=C3=0.1μF
C4=10μF
R1, R2, R3 depends on SerDes IC specification.
(Consult the SerDes IC application information)
R4=510Ω

NOTE:
1. Transmission line characteristic impedance Z=50Ω.
2. R1, R2, R3 as close to SerDes IC as possible.
Recommended DC Coupling Interface Circuit:

**1 X 9 Transceiver (DC Data Coupling)**

- **Transmitter:**
  - Laser
  - Driver

- **Receiver:**
  - PIN
  - Pre-Amp.
  - Limiting Amp.

**SerDes IC (DC Data Coupling)**

- **Transmitter:**
  - DATA OUT+
  - Z=50Ω
  - (9) VEET
  - (8) TD+
  - Z=50Ω

- **Receiver:**
  - DATA OUT-
  - Z=50Ω
  - (7) TD-
  - Z=50Ω
  - (6) VCCT
  - (5) VCCR
  - (4) SD
  - (3) RD-
  - (2) RD+

- **Serializer/Deserializer:**
  - VCC_SerDes
  - VCC_SerDes
  - DATA IN-
  - DATA IN+

**Note:**
1. Transmission line characteristic impedance Z=50Ω.
2. R1, R2, R3, R4, R5, R6 as close to SerDes IC as possible.
3. R7, R8 as close to 1X9 Transceiver as possible.

**Component Values:**
- L1=L2=1µH or ferrite bead
- C1=C2=C3=C5=C6=0.1µF
- C4=10µF
- R1, R2, R3, R4, R5, R6 depends on SerDes IC specification.
- R7=R8=270Ω (VCC=3.3V)
- R9=510Ω (VCC=5V)