25G SFP28 850nm 100m DOM Transceiver

SFP28-25GSR-85

Application

• 25GBASE-SR Ethernet

Features

• Hot-pluggable SFP28 form factor
• Supports 25Gbps data rate
• Power dissipation < 1W
• RoHS-6 compliant
• Digital diagnostics functions are available via the I2C interface
• Commercial case temperature range: 0° C to 70° C
• Single 3.3V power supply
• Maximum link length of 70m on OM3 MMF and 100m on OM4 MMF
• 850nm VCSEL laser and PIN photodetector
• Internal CDR on both Transmitter and Receiver channel
• Duplex LC receptacle
• Built-in digital diagnostic functions
**Description**

The Technologies SFP28-25GSR-85 is a single-Channel, Pluggable, Fiber-Optic SFP28 for 25 Gigabit Ethernet and Infiniband EDR Applications. It is a high performance module for short-range data communication and interconnect applications which operate at 25.78125Gbps up to 70 m using OM3 fiber or 100 m using OM4 fiber.

This module is designed to operate over multimode fiber systems using a nominal wavelength of 850nm. The electrical interface uses a 20 contact edge type connector. The optical interface uses duplex LC receptacle. This module incorporates Technologies proven circuit and VCSEL technology to provide reliable long life, high performance, and consistent service.

**Product Specifications**

I. **Optical and Electrical Characteristics**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Min</th>
<th>Typ.</th>
<th>Max</th>
<th>Unit</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transmitter</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Data Rate</strong></td>
<td>BR</td>
<td>25.78</td>
<td>860</td>
<td></td>
<td>Gbps</td>
<td></td>
</tr>
<tr>
<td><strong>Centre Wavelength</strong></td>
<td>λc</td>
<td>840</td>
<td>850</td>
<td>0.6</td>
<td>nm</td>
<td></td>
</tr>
<tr>
<td><strong>Spectral Width (-20dB)</strong></td>
<td>σ</td>
<td></td>
<td></td>
<td>2.4</td>
<td>nm</td>
<td></td>
</tr>
<tr>
<td><strong>Average Output Power</strong></td>
<td>Pavg</td>
<td>-5</td>
<td>2.4</td>
<td></td>
<td>dBm</td>
<td></td>
</tr>
<tr>
<td><strong>Optical Power OMA</strong></td>
<td>P_{OMA}</td>
<td>-6.4</td>
<td></td>
<td></td>
<td>dBm</td>
<td></td>
</tr>
<tr>
<td><strong>Extinction Ratio</strong></td>
<td>ER</td>
<td>2</td>
<td>1000</td>
<td></td>
<td>dB</td>
<td></td>
</tr>
<tr>
<td><strong>Differential data input swing</strong></td>
<td>V_{INPP}</td>
<td>40</td>
<td>110</td>
<td></td>
<td>mV</td>
<td></td>
</tr>
<tr>
<td><strong>Input Differential Impedance</strong></td>
<td>Z_{IN}</td>
<td>90</td>
<td>100</td>
<td>Vcc</td>
<td>Ω</td>
<td></td>
</tr>
<tr>
<td><strong>TX Disable</strong></td>
<td></td>
<td>2.0</td>
<td>0.8</td>
<td>V</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>TX Disable(Enable)</strong></td>
<td></td>
<td>0</td>
<td>Vcc</td>
<td>V</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>TX Fault</strong></td>
<td></td>
<td>2.0</td>
<td>0.8</td>
<td>V</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>TX Fault(Normal)</strong></td>
<td></td>
<td>0</td>
<td>860</td>
<td>V</td>
<td></td>
<td></td>
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</table>
### Receiver

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Min</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data Rate</td>
<td>BR 25.78 Gbps</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Centre Wavelength</td>
<td>( \lambda_c )</td>
<td>840</td>
<td>850</td>
<td>0.6</td>
</tr>
<tr>
<td>Receiver Sensitivity (OMA)</td>
<td>( P_{sens} )</td>
<td>-10.3</td>
<td></td>
<td>dBm</td>
</tr>
<tr>
<td>Stressed Sensitivity (OMA)</td>
<td></td>
<td>-5.2</td>
<td></td>
<td>dBm</td>
</tr>
<tr>
<td>Receiver Power (OMA)</td>
<td></td>
<td>3</td>
<td></td>
<td>dBm</td>
</tr>
<tr>
<td>LOS De-Assert</td>
<td>( P_{LOS_D} )</td>
<td>-13</td>
<td></td>
<td>dBm</td>
</tr>
<tr>
<td>LOS Assert</td>
<td>( P_{LOS_A} )</td>
<td>-30</td>
<td></td>
<td>dBm</td>
</tr>
<tr>
<td>LOS Hysteresis</td>
<td></td>
<td>0.5</td>
<td></td>
<td>dB</td>
</tr>
<tr>
<td>Differential data output swing</td>
<td>( V_{out,PP} )</td>
<td>500</td>
<td>1130</td>
<td>mV</td>
</tr>
<tr>
<td>LOS</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High</td>
<td></td>
<td>2.0</td>
<td>( V_{cc} )</td>
<td>V</td>
</tr>
<tr>
<td>Low</td>
<td></td>
<td>0.8</td>
<td></td>
<td>V</td>
</tr>
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</table>

### II. Absolute Maximum Ratings

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Min</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply Voltage</td>
<td>( V_{cc} )</td>
<td>0</td>
<td>3.6</td>
<td>V</td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>( T_s )</td>
<td>-40</td>
<td>85</td>
<td>°C</td>
</tr>
<tr>
<td>Operating Humidity</td>
<td></td>
<td>5</td>
<td>85</td>
<td>%</td>
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### III. Recommended Operating Conditions

<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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</thead>
<tbody>
<tr>
<td>Operating Case Temperature (Commercial)</td>
<td>( T_c )</td>
<td>0</td>
<td></td>
<td>70</td>
<td>°C</td>
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</tbody>
</table>
### Power Supply Voltage

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Min</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vcc</td>
<td></td>
<td>3.13</td>
<td>3.3</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3.47</td>
<td></td>
<td>V</td>
</tr>
</tbody>
</table>

### Power Supply Current

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Min</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Icc</td>
<td>300</td>
<td>mA</td>
</tr>
</tbody>
</table>

### Fiber Length on 50/125μm high-bandwidth (OM3) MMF

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Min</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>70</td>
<td>m</td>
</tr>
</tbody>
</table>

### Fiber Length on 50/125μm high-bandwidth (OM4) MMF

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Min</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>100</td>
<td>m</td>
</tr>
</tbody>
</table>

## IV. Block Diagram

![Block Diagram](image)

## V. Timing and Electrical

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Min</th>
<th>Max</th>
<th>Unit</th>
<th>Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tx-Disable assert time</td>
<td>t-off</td>
<td>100</td>
<td>μs</td>
<td></td>
<td>Rising edge of Tx_Disable to fall of output signal below 10% of nominal</td>
</tr>
<tr>
<td>Tx-Disable negate time</td>
<td>T-on</td>
<td>2</td>
<td>ms</td>
<td></td>
<td>Falling edge of Tx_Disable to rise of output signal above 90% of nominal. This only applies in normal operation, not during start up or fault recovery</td>
</tr>
</tbody>
</table>
| Time to initialize 2-wire interface | \( t_{2w\_start\_up} \) | 300 ms | From power on or hot plug after the supply meeting Table 8

| Time to initialize | \( t_{start\_up} \) | 300 ms | From power supplies meeting Table 8 or hot plug or Tx disable negated during power up, or Tx_Fault recovery, until non-cooled power level I part(or non-cooled power level II part already enabled at power level II for Tx_Fault recovery) is fully operational

| Time to initialize cooled module and time to power up a cooled module to Power Level II | \( t_{start\_up\_cooled} \) | 90 s | From power supplies meeting Table 8 or hot plug or Tx disable negated during power up, or Tx_Fault recovery, until cooled power level I part(or cooled power level II part during fault recovery) is fully operational. Also, from stop bit low-to-high SDA transition enabling Power Level II until cooled module is fully operational

| Time to Power Up to Level II | \( t_{power\_level2} \) | 300 ms | From stop bit low-to-high SDA transition enabling power level II until non-cooled module is fully operational

| Time to Power Down from level II | \( t_{power\_down} \) | 300 ms | From stop bit low-to-high SDA transition disabling power level II until module is within power level I requirements

| Tx_Fault assert | \( t_{Fault\_on} \) | 1 ms | From occurrence of fault to assertion of Tx_Fault

| Tx_Fault assert for cooled module | \( t_{Fault\_on\_cooled} \) | 50 ms | From occurrence of fault to assertion of Tx_Fault

| Tx_Fault Reset | \( t_{reset} \) | 10 \( \mu \)s | Time Tx_Disable must be held high to rest Tx_Fault

| RS0, RS1 rate select timing for FC | \( t_{RS0\_FC}, t_{RS1\_FC} \) | 500 \( \mu \)s | From assertion till stable output

| RS0, RS1 rate select timing non FC | \( t_{RS0}, t_{RS1} \) | 24 ms | From assertion till stable output

| Rx_Los assert delay | \( t_{los\_on} \) | 100 \( \mu \)s | From occurrence of loss of signal to assertion of Rx_Los

| Rx_Los negate delay | \( t_{los\_off} \) | 100 \( \mu \)s | From occurrence of presence of signal to negation of Rx_Los
VI. Diagnostic Specifications

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Range</th>
<th>Unit</th>
<th>Accuracy</th>
<th>Calibration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature</td>
<td>0 to +70</td>
<td>°C</td>
<td>±3 °C</td>
<td>Internal / External</td>
</tr>
<tr>
<td>Voltage</td>
<td>3.0 to 3.6</td>
<td>V</td>
<td>±3%</td>
<td>Internal / External</td>
</tr>
<tr>
<td>Bias Current</td>
<td>0 to 20</td>
<td>mA</td>
<td>±10%</td>
<td>Internal / External</td>
</tr>
<tr>
<td>TX Power</td>
<td>-8 to 3</td>
<td>dBm</td>
<td>±3dB</td>
<td>Internal / External</td>
</tr>
<tr>
<td>RX Power</td>
<td>-14 to 0</td>
<td>dBm</td>
<td>±3dB</td>
<td>Internal / External</td>
</tr>
</tbody>
</table>

The transceivers provide serial ID memory contents and diagnostic information about the present operating conditions by the 2-wire serial interface (SCL, SDA).

The diagnostic information with internal calibration or external calibration all are implemented, including received power monitoring, transmitted power monitoring, bias current monitoring, supply voltage monitoring and temperature monitoring.

The digital diagnostic memory map specific data field defines as following.
VII. Pin Definitions

Pin Description

<table>
<thead>
<tr>
<th>Pin</th>
<th>Logic</th>
<th>Symbol</th>
<th>Name/Description</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td>VeeT</td>
<td>Module Transmitter Ground</td>
<td>1</td>
</tr>
<tr>
<td>Pin</td>
<td>Signal Type</td>
<td>Signal Name</td>
<td>Description</td>
<td>Pin Count</td>
</tr>
<tr>
<td>-----</td>
<td>-------------</td>
<td>-------------------</td>
<td>-------------------------------------------------------</td>
<td>-----------</td>
</tr>
<tr>
<td>2</td>
<td>LVTTL-O</td>
<td>TX_Fault</td>
<td>Module Transmitter Fault</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>LVTTL-I</td>
<td>TX_Dis</td>
<td>Transmitter Disable; Turns off transmitter laser output</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>LVTTL-I/O</td>
<td>SDA</td>
<td>2-Wire Serial Interface Data Line</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td>LVTTL-I</td>
<td>SCL</td>
<td>2-Wire Serial Interface Clock</td>
<td>2</td>
</tr>
<tr>
<td>6</td>
<td>MOD_ABS</td>
<td></td>
<td>Module Definition, Grounded in the module</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>LVTTL-I</td>
<td>RS0</td>
<td>Receiver Rate Select</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>LVTTL-O</td>
<td>RX_LOS</td>
<td>Receiver Loss of Signal Indication Active LOW</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>LVTTL-I</td>
<td>RS1</td>
<td>Transmitter Rate Select (not used)</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>VeeR</td>
<td></td>
<td>Module Receiver Ground</td>
<td>1</td>
</tr>
<tr>
<td>11</td>
<td>VeeR</td>
<td></td>
<td>Module Receiver Ground</td>
<td>1</td>
</tr>
<tr>
<td>12</td>
<td>CML-O</td>
<td>RD-</td>
<td>Receiver Inverted Data Output</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>CML-O</td>
<td>RD+</td>
<td>Receiver Data Output</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>VeeR</td>
<td></td>
<td>Module Receiver Ground</td>
<td>1</td>
</tr>
<tr>
<td>15</td>
<td>VccR</td>
<td></td>
<td>Module Receiver 3.3 V Supply</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>VccT</td>
<td></td>
<td>Module Receiver 3.3 V Supply</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>VeeT</td>
<td></td>
<td>Module Transmitter Ground</td>
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</tr>
<tr>
<td>18</td>
<td>CML-I</td>
<td>TD+</td>
<td>Transmitter Non-Inverted Data Input</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>CML-I</td>
<td>TD-</td>
<td>Transmitter Inverted Data Input</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>VeeT</td>
<td></td>
<td>Module Transmitter Ground</td>
<td>1</td>
</tr>
</tbody>
</table>

**Notes:**
1. Module ground pins GND are isolated from the module case.
2. Shall be pulled up with 4.7K-10Kohms to a voltage between 3.15V and 3.45V on the host board.
VIII. Recommended Interface Circuit
IX. Mechanical Dimensions
Test Center

FS.COM transceivers are tested to ensure connectivity and compatibility in our test center before shipped out. FS.COM test center is supported by a variety of mainstream original brand switches and groups of professional staff, helping our customers make the most efficient use of our products in their systems, network designs and deployments.

The original switches could be found nowhere but at FS.COM test center, eg: Juniper MX960 & EX 4300 series, Cisco Nexus 9396PX & Cisco ASR 9000 Series, HP 5900 Series & HP 5406R ZL2 V3(J9996A), Arista 7050S-64, Brocade ICX7750-26Q & ICX6610-48, Avaya VSP 7000 MDA 2, etc.
Test Assured Program

FS.COM truly understands the value of compatibility and interoperability to each optics. Every module FS.COM provides must run through programming and an extensive series of platform diagnostic tests to prove its performance and compatibility. In our test center, we care of every detail from staff to facilities—professionally trained staff, advanced test facilities and comprehensive original-brand switches, to ensure our customers to receive the optics with superior quality.

Our smart data system allows effective product management and quality control according to the unique serial number, properly tracking the order, shipment and every part. Our in-house coding facility programs all of our parts to standard OEM specs for compatibility on all major vendors and systems such as Cisco, Juniper, Brocade, HP, Dell, Arista and so on.

With a comprehensive line of original-brand switches, we can recreate an environment and test each optics in practical application to ensure quality and distance. The last test assured step to ensure our products to be shipped with perfect package.
## Order Information

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
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<tbody>
<tr>
<td>SFP28-25GSR-85</td>
<td>25G SFP28 850nm 100m DOM Transceiver</td>
</tr>
<tr>
<td>SFP28-25GLR-31</td>
<td>25G SFP28 1310nm 10km DOM Transceiver</td>
</tr>
<tr>
<td>CWDM-SFP25G-10SP</td>
<td>25G CWDM SFP28 1270nm 10km DOM Transceiver</td>
</tr>
<tr>
<td>CWDM-SFP25G-10SP</td>
<td>25G CWDM SFP28 1290nm 10km DOM Transceiver</td>
</tr>
<tr>
<td>CWDM-SFP25G-10SP</td>
<td>25G CWDM SFP28 1310nm 10km DOM Transceiver</td>
</tr>
<tr>
<td>CWDM-SFP25G-10SP</td>
<td>25G CWDM SFP28 1330nm 10km DOM Transceiver</td>
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