

# SO-SFP-4GFC-L5D

SFP, 4/2/1 Gbps FC/FICON, 1310nm, SM, DDM, 10dB, 5km

## OVERVIEW

The SO-SFP-4GFC-L5D series single mode transceiver is small form factor pluggable module for duplex optical data communications such as 4x/2x/1x Fiber Channel and 1000BASE-LX Ethernet. It is with the SFP 20-pin connector to allow hot plug capability. This module is designed for single mode fiber and operates at a nominal wavelength of 1310nm. The transmitter section uses a 1310nm 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. The SO-SFP-4GFC-L5D series are designed to be compliant with SFF-8472 Multi-source Agreement (MSA).

## PRODUCT FEATURES

- Operating data rate up to 4.25Gbps
- 5km with 9/125  $\mu$ m SMF
- Single 3.3V power supply and TTL logic interface
- Hot-Pluggable SFP footprint duplex LC connector interface
- Class 1 FDA and IEC60825-1 laser safety compliant
- Operating temperature
  - Standard: 0°C~+70 °C
  - Industrial:-40 °C~+85 °C
- Compliant with SFP MSA specification
- Compliant with Digital Diagnostic Monitor (DDM) interface

## APPLICATIONS

- 4/2/1Gbps Fibre Channel
- 1000Base Ethernet
- SAN / WAN networking

## ORDERING INFORMATION

| Part Number        | Description   |
|--------------------|---|
| SO-SFP-4GFC-L5D    | SFP, 4/2/1 Gbps FC/FICON, 1310nm, SM, DDM, 10dB, 5km            |
| SO-SFP-4GFC-L5D -I | SFP, 4/2/1 Gbps FC/FICON, 1310nm, SM, DDM, 10dB, 5km, ind.temp. |

## ABSOLUTE MAXIMUM RATINGS

| Parameter                   | Symbol | Min  | Max | Unit |
|-----------------------------|--------|------|-----|------|
| Storage Temperature         | TS     | -40  | +85 | °C   |
| Supply Voltage              | VCC    | -0.5 | 3.6 | V    |
| Operating Relative Humidity |        |      | 95  | %    |

## RECOMMENDED OPERATING CONDITIONS

| Parameter                  | Symbol | Min                | Typ  | Max  | Unit |    |
|----------------------------|--------|--------------------|------|------|------|----|
| Operating Case Temperature | TA     | SO-SFP-4GFC-L5D    | 0    |      | +70  | °C |
|                            |        | SO-SFP-4GFC-L5D -I | -40  |      | +85  | °C |
| Power Supply Voltage       | Vcc    | 3.15               | 3.3  | 3.45 | V    |    |
| Power Supply Current       | Icc    |                    |      | 300  | mA   |    |
| Data Rate                  |        |                    | 4.25 |      | Gbps |    |

## PERFORMANCE SPECIFICATIONS – ELECTRICAL TRANSMITTER

| Parameter                      | Symbol          | Min | Typ | Max     | Unit | Notes                            |
|--------------------------------|-----------------|-----|-----|---------|------|----------------------------------|
| CML Inputs(Differential)       | V <sub>IN</sub> | 400 |     | 1600    | mVpp | AC coupled inputs                |
| Input Impedance (Differential) | Z <sub>IN</sub> | 85  | 100 | 115     | ohms | R <sub>in</sub> > 100 kohms @ DC |
| TX Disable                     | Disable         | 2   |     | Vcc     | V    |                                  |
|                                | Enable          | 0   |     | 0.8     |      |                                  |
| TX FAULT                       | Fault           | 2   |     | Vcc+0.3 | V    |                                  |
|                                | Normal          | 0   |     | 0.8     |      |                                  |

## PERFORMANCE SPECIFICATIONS – ELECTRICAL RECEIVER

| Parameter                       | Symbol           | Min | Typ | Max     | Unit | Notes              |
|---------------------------------|------------------|-----|-----|---------|------|--------------------|
| CML Outputs (Differential)      | V <sub>out</sub> | 400 | 800 | 1200    | mVpp | AC coupled outputs |
| Output Impedance (Differential) | Z <sub>out</sub> | 85  | 100 | 115     | ohms |                    |
| Rx_LOS Output Voltage – High    |                  | 2   |     | Vcc+0.3 | V    |                    |
| Rx_LOS Output Voltage – Low     |                  | 0   |     | 0.8     | V    |                    |
| MOD_DEF ( 2:0 )                 | VoH              | 2.5 |     |         | V    | With Serial ID     |
|                                 | VoL              | 0   |     | 0.5     | V    |                    |

## OPTICAL AND ELECTRICAL CHARACTERISTICS

| Parameter             | Symbol | Min | Typ | Max  | Unit |
|-----------------------|--------|-----|-----|------|------|
| 9µm Core Diameter SMF | L      |     | 5   |      | km   |
| Data Rate             |        |     |     | 4.25 | Gbps |

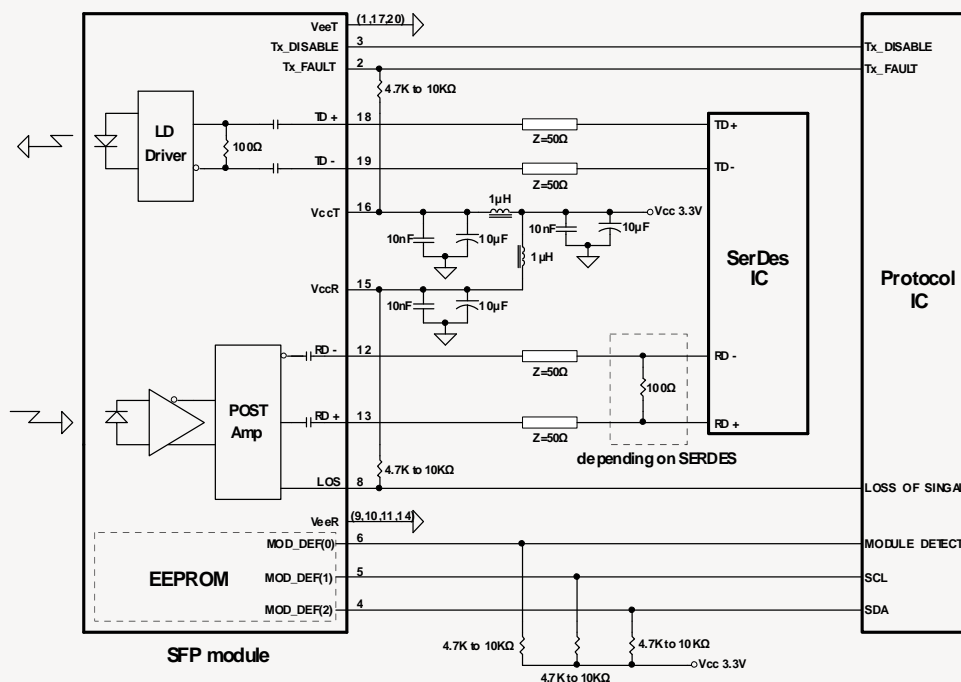
## OPTICAL AND ELECTRICAL CHARACTERISTICS TRANSMITTER

| Parameter                | Symbol          | Min                                    | Typ  | Max  | Unit |
|--------------------------|-----------------|--|------|------|------|
| Centre Wavelength        | $\lambda_c$     | 1260                                   | 1310 | 1360 | nm   |
| Spectral Width (RMS)     | $\Delta\lambda$ |  |      | 4    | nm   |
| Average Output Power     | $P_{out}$       | -8                                     |      | -3   | dBm  |
| Rise/Fall Time(20%~80%)  | $tr/tf$         |  |      | 90   | ps   |
| Output Optical Eye       |                 | Complies with ANSI FC-PI specification |      |      |      |
| TX Disable Assert Time   | $t_{off}$       |  |      | 10   | us   |
| Pout@TX Disable Asserted | $P_{out}$       |  |      | -45  | dBm  |

## OPTICAL AND ELECTRICAL CHARACTERISTICS RECEIVER

| Parameter            | Symbol    | Min       | Typ | Max  | Unit |
|----------------------|-----------|-----------|-----|------|------|
| Centre Wavelength    | $\lambda$ | 1260      |     | 1600 | nm   |
| Receiver Sensitivity | 4FC       |           |     | -18  | dBm  |
|                      | 2FC       | $P_{min}$ |     | -21  |      |
|                      | FC        |           |     | -22  |      |
| Receiver Overload    | $P_{max}$ | -3        |     |      | dBm  |
| Reflection           |           |           |     | -27  | dB   |
| LOS De-Assert        | $LOSD$    |           |     | -19  | dBm  |
| LOS Assert           | $LOSA$    | -35       |     |      | dBm  |
| LOS Hysteresis       |           | 0.5       |     |      | dB   |

## RECOMMENDED CIRCUIT SCHEMATIC



## PIN FUNCTION DEFINITIONS

| PIN | Signal Name       | Description  | PIN | Signal Name       | Description                 |
|-----|-------------------|--|-----|-------------------|-----------------------------|
| 1   | V <sub>EE</sub> T | Transmitter Signal Ground  | 11  | V <sub>EE</sub> R | Receiver Signal Ground      |
| 2   | TX_Fault          | Transmitter Fault Indication. Logic "1" Output = Laser Fault. Logic "0" Output = Normal Operation                                  | 12  | RD-               | Inverse Receiver Data Out   |
| 3   | TX_Disable        | Logic "1" Input (or no connection) = Laser off, Logic "0" = Laser on.  | 13  | RD+               | Receiver Data Out           |
| 4   | SDA               | Modulation Definition 2 – Two wires serial ID Interface  | 14  | V <sub>EE</sub> R | Receiver Signal Ground      |
| 5   | SDL               | Modulation Definition 1 – Two wires serial ID Interface  | 15  | V <sub>CC</sub> R | Receiver Power – 3.3V±5%    |
| 6   | MOD-ABS           | Modulation Definition 0 – Ground in Module   | 16  | V <sub>CC</sub> T | Transmitter Power – 3.3V±5% |
| 7   | RS0               | RX Rate Select (LVTTTL). This pin has an internal 30k pulldown to ground. A signal on this pin will not affect module performance. | 17  | V <sub>EE</sub> T | Transmitter Signal Ground   |
| 8   | RX_LOS            | Loss of Signal Out (OC).   | 18  | TD+               | Transmitter Data In         |
| 9   | RS1               | TX Rate Select (LVTTTL). This pin has an internal 30k pulldown to ground. A signal on this pin will not affect module performance. | 19  | TD-               | Inverse Transmitter Data In |
| 10  | V <sub>EE</sub> R | Receiver Signal Ground   | 20  | V <sub>EE</sub> T | Transmitter Signal Ground   |

## MECHANICAL DRAWING

