

TKSX12-3LCD20

1.25Gbps CWDM SFP Optical Transceiver, 20KM Reach

Features

- Data-rate of 1.25Gbps operation
- 18 CWDM DFB wavelengths laser and PIN photodetector for 20km transmission ➤
Compliant with SFP MSA and SFF-8472 with duplex LC receptacle ➤ Digital Diagnostic Monitoring:
Internal Calibration or External Calibration
- Compatible with SONET OC-24-LR-1
- Compatible with RoHS ➤ +3.3V single power supply ➤ Operating case temperature:
Commercial Temperature: 0 to +70°C Industrial
Temperature: -40 to +85°C

Applications

- Gigabit Ethernet
- Fiber Channel
- Switch to Switch interface
- Switched backplane applications
- Router/Server interface
- Other optical transmission systems

Description

The SFP transceivers are high performance, cost effective modules supporting data-rate of 1.25Gbps and 20KM transmission distance with SMF.

The transceiver consists of three sections: an uncooled CWDM DFB laser transmitter, a PIN photodiode integrated with a trans-impedance preamplifier (TIA) and MCU control unit. All modules satisfy class I laser safety requirements.

The transceivers are compatible with SFP Multi-Source Agreement (MSA) and SFF-8472. For further information, please refer to SFP MSA.

Product Selection

Module Block Diagram

Recommended Operating Conditions

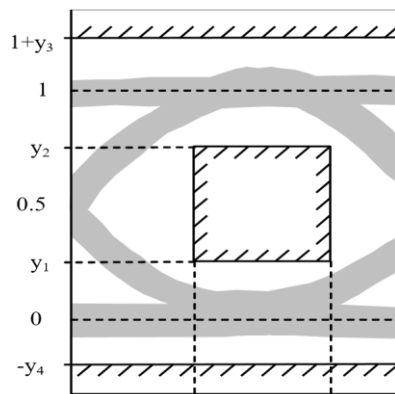
| Parameter | Symbol | Min. | Typ. | Max. | Unit | Note |
|------------------------------|-------------------|------|-----------|------|-------|-----------------|
| Case Operating Temperature | Tcase | 0 | | 70 | °C | |
| Power Supply Voltage | VCC | 3.13 | 3.3 | 3.47 | V | |
| Power Supply Current | ICC | | | 300 | mA | |
| Power Supply Noise Rejection | | | | 100 | mVp-p | 100Hz to 1MHz |
| Data Rate | | | 1250/1250 | | Mbps | TX Rate/RX Rate |
| Transmission Distance | | | | 20 | KM | |
| Coupled Fiber | Single mode fiber | | | | | 9/125um SMF |

Specification of Transmitter

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Note |
|-----------------------------------|---|------------------------|------|------------------------|------|-----------------------|
| Average Output Power | POUT | -9 | | -3 | dBm | Note (1) |
| Extinction Ratio | ER | 8.2 | | | dB | |
| Center Wavelength | λ_C | $(1XX0)-\Delta\lambda$ | 1XX0 | $(1XX0)+\Delta\lambda$ | nm | DFB Laser Note (2) |
| Side Mode Suppression Ratio | SMSR | 30 | | | dB | |
| Spectrum Bandwidth(-20dB) | σ | | | 1 | nm | |
| Transmitter OFF Output Power | POff | | | -45 | dBm | |
| Differential Line Input Impedance | RIN | 90 | 100 | 110 | Ohm | |
| Output Eye Mask | Compliant with G.957 (class 1 laser safety) | | | | | Note (3) |

Note:

- 1) Measure at 2²³-1 NRZ PRBS pattern
- 2) "XX" is: 27,29,31,33,35,37,39,41,43,45,47,49,51,53,55,57,59 and 61; " $\Delta\lambda$ " is 7.5
- 3) Transmitter eye mask definition



| | |
|-----------|------|
| x_3-x_2 | 0.2 |
| y_1 | 0.25 |
| y_2 | 0.75 |
| y_3 | 0.25 |
| y_4 | 0.25 |

Specification of Receiver

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Note |
|-----------------------------------|----------------|------|------|------|------|----------|
| Input Optical Wavelength | λ_{IN} | 1270 | | 1610 | nm | PIN |
| Receiver Sensitivity | PIN | | | -22 | dBm | Note (1) |
| Input Saturation Power (Overload) | PSAT | -9 | | | dBm | |
| Loss Of Signal Assert | PA | -35 | | | dBm | |
| Loss Of Signal De-assert | PD | | | -24 | dBm | Note (2) |
| LOS Hysteresis | PA-PD | 0.5 | 2 | 6 | dB | |

Notes:

- 1) Measured with Light source 1XX0 nm, ER=8.2dB; BER $\leq 10^{-12}$ @ PRBS=2²³-1 NRZ, "XX" is: 27,29,31,33,35,37,39,41,43,45,47,49,51,53,55,57,59 and 61\
- 2) When LOS de-asserted, the RX data+/- output is High-level (fixed)

Electrical Interface Characteristics

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Note |
|--------------------------------|--------|------|------|----------------------|------|----------|
| Transmitter | | | | | | |
| Total Supply Current | ICC | | | A | mA | Note (1) |
| Transmitter Disable Input-High | VDISH | 2 | | V _{CC} +0.3 | V | |
| Transmitter Disable Input-Low | VDISL | 0 | | 0.8 | V | |
| Transmitter Fault Input-High | VTxFH | 2 | | V _{CC} +0.3 | V | |
| Transmitter Fault Input-Low | VTxFL | 0 | | 0.8 | V | |
| Receiver | | | | | | |
| Total Supply Current | ICC | | | B | mA | Note (1) |
| LOSS Output Voltage-High | VLOSH | 2 | | V _{CC} +0.3 | V | LVTTTL |
| LOSS Output Voltage-Low | VLOSL | 0 | | 0.8 | V | |

Note:

- 1) A (TX) + B (RX) = 300mA (Not include termination circuit)

Pin Descriptions

| Pin | Symbol | Name/Description | NOTE |
|-----|--------------------|---|------|
| 1 | V _{EET} | Transmitter Ground (Common with Receiver Ground) | 1 |
| 2 | T _{FAULT} | Transmitter Fault. | |
| 3 | T _{DIS} | Transmitter Disable. Laser output disabled on high or open. | 2 |

| | | | |
|----|------------------|--|---|
| 4 | MOD_DEF(2) | Module Definition 2. Data line for Serial ID. | 3 |
| 5 | MOD_DEF(1) | Module Definition 1. Clock line for Serial ID. | 3 |
| 6 | MOD_DEF(0) | Module Definition 0. Grounded within the module. | 3 |
| 7 | Rate Select | No connection required | 4 |
| 8 | LOS | Loss of Signal indication. Logic 0 indicates normal operation. | 5 |
| 9 | V _{EER} | Receiver Ground (Common with Transmitter Ground) | 1 |
| 10 | V _{EER} | Receiver Ground (Common with Transmitter Ground) | 1 |
| 11 | V _{EER} | Receiver Ground (Common with Transmitter Ground) | 1 |
| 12 | RD- | Receiver Inverted DATA out. AC Coupled | |
| 13 | RD+ | Receiver Non-inverted DATA out. AC Coupled | |
| 14 | V _{EER} | Receiver Ground (Common with Transmitter Ground) | 1 |
| 15 | V _{CCR} | Receiver Power Supply | |
| 16 | V _{CCT} | Transmitter Power Supply | |
| 17 | V _{EET} | Transmitter Ground (Common with Receiver Ground) | 1 |
| 18 | TD+ | Transmitter Non-Inverted DATA in. AC Coupled. | |
| 19 | TD- | Transmitter Inverted DATA in. AC Coupled. | |
| 20 | V _{EET} | Transmitter Ground (Common with Receiver Ground) | 1 |

Notes:

- 1) Circuit ground is internally isolated from chassis ground.
- 2) Laser output disabled on TDIS >2.0V or open, enabled on TDIS <0.8V.
- 3) Should be pulled up with 4.7k - 10kohms on host board to a voltage between 2.0V and 3.6V. MOD_DEF (0) pulls line low to indicate module is plugged in.
- 4) This is an optional input used to control the receiver bandwidth for compatibility with multiple data rates (most likely Fiber Channel 1x and 2x Rates). If implemented, the input will be internally pulled down with > 30kΩ resistor. The input states are:
 - i. Low (0 – 0.8V): Reduced Bandwidth
 - ii. (>0.8, < 2.0V): Undefined
 - iii. High (2.0 – 3.465V): Full Bandwidth
 - iv. Open: Reduced Bandwidth
- 5) LOS is open collector output should be pulled up with 4.7k - 10kohms on host board to a voltage between 2.0V and 3.6V. Logic 0 indicates normal operation; logic 1 indicates loss of signal.

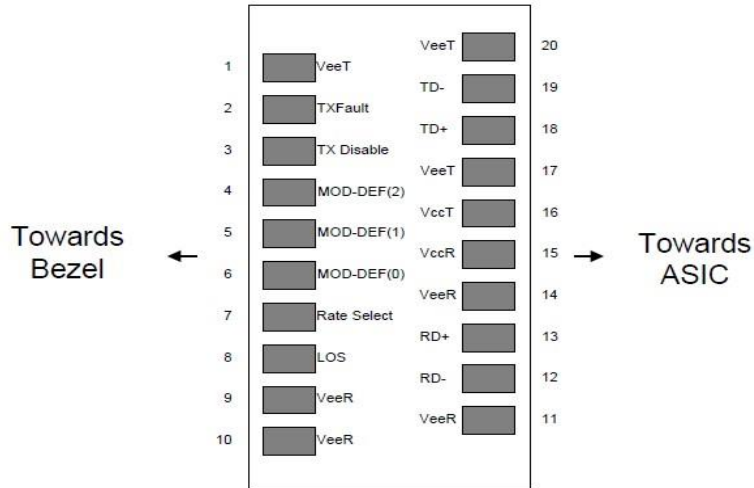


Figure2. Pin out of Connector Block on Host Board

Absolute Maximum Ratings

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Note |
|---------------------------|--------|------|------|---------|------|------|
| Storage Temperature | Ts | -40 | | 85 | °C | |
| Relative Humidity | RH | 5 | | 95 | % | |
| Power Supply Voltage | VCC | -0.5 | | 4 | V | |
| Signal Input Voltage | | -0.3 | | Vcc+0.3 | V | |
| Receiver Damage Threshold | | +6 | | | dBm | |

Digital Diagnostic Functions

TKSX12-3LCD20 transceivers support the 2-wire serial communication protocol as defined in the SFP MSA. It is very closely related to the E2PROM defined in the GBIC standard, with the same electrical specifications.

The standard SFP serial ID provides access to identification information that describes the transceiver's capabilities, standard interfaces, manufacturer, and other information.

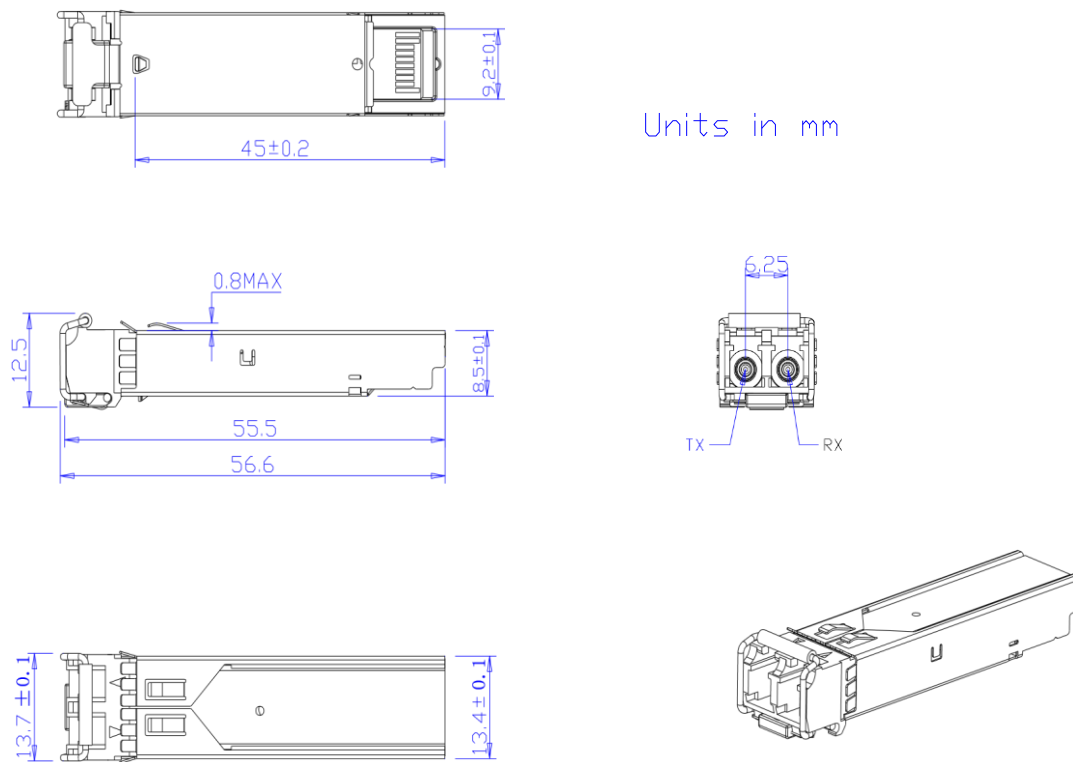
Additionally, SFP transceivers provide a unique enhanced digital diagnostic monitoring interface, which allows real-time access to device operating parameters such as transceiver temperature, laser bias current, transmitted optical power, received optical power and transceiver supply voltage. It also defines a sophisticated system of alarm and warning flags, which alerts end-users when particular operating parameters are outside of a factory set normal range.

The SFP MSA defines a 256-byte memory map in E2PROM that is accessible over a 2-wire serial interface at the 8 bit address 1010000X (A0h). The digital diagnostic monitoring interface makes use of the 8 bit address 1010001X (A2h), so the originally defined serial ID memory map remains unchanged. The interface is identical to, and is thus fully backward compatible with both the GBIC Specification and the SFP Multi Source Agreement.

The operating and diagnostics information is monitored and reported by a Digital Diagnostics Transceiver Controller (DDTC) inside the transceiver, which is accessed through a 2-wire serial interface. When the serial protocol is activated, the serial clock signal (SCL, Mod Def 1) is generated by the host. The positive edge clocks data into the SFP transceiver into those segments of the E2PROM that are not write-protected. The negative edge clocks data from the SFP transceiver. The serial data signal (SDA, Mod Def 2) is bi-directional for serial data transfer. The host uses SDA in conjunction with SCL to mark the start and end of serial protocol activation. The memories are organized as a series of 8-bit data words that can be addressed individually or sequentially.

Digital diagnostics for the TKSX12-3LCD20 are internally calibrated by default

Mechanical Specifications (Unit: mm)



Regulatory Compliance

| Feature | Reference | Performance |
|------------------------------------|---|---------------------------|
| Electrostatic discharge (ESD) | IEC/EN 61000-4-2 | Compatible with standards |
| Electromagnetic Interference (EMI) | FCC Part 15 Class B EN 55022 Class B (CISPR 22A) | Compatible with standards |
| Laser Eye Safety | FDA 21CFR 1040.10, 1040.11 IEC/EN 60825-1, 2 | Class 1 laser product |
| Component Recognition | IEC/EN 60950, UL | Compatible with standards |
| ROHS | 2002/95/EC | Compatible with standards |
| EMC | EN61000-3 | Compatible with standards |