

OC-3 1510NM OPTICAL SUPERVISORY CHANNEL SFP TRANSCEIVER

TRCE03KE2C000C3

Product Description

The TRCE03KE2C000C3 SFP fiber optic transceiver with integrated digital diagnostics monitoring functionality provides a quick and reliable interface for optical supervisory channel applications. The diagnostic functions, alarm and warning features as described in the Multi-Source Agreement (MSA) document, SFF-8472 (Rev. 9.4), are provided via an I²C serial interface.

The TRCE03KE2C000C3 transceiver uses a 1510nm DFB laser and an APD receiver to provide an optical link power budget of 44dB. The transceiver satisfies Class I Laser Safety requirements in accordance with the U.S. FDA/CDRH and international IEC-60825 standards.

The transceiver connects to a standard 20-pad connector for hot plug capability. This allows the system designer to make configuration changes or maintenance by simply plugging in different types of transceivers without removing the power supply from the host system.

The transceiver has a blue bail-type latch, which offers an easy and convenient way to release the module. The latch is compliant with the SFP MSA.

The transmitter and receiver DATA interfaces are AC coupled internally. LV-TTL Transmitter Disable control input and Loss of Signal output interfaces are also provided.

The transceiver operates from a single +3.3V power supply over an operating case temperature range of -5°C to +70°C (COM). The housing is made of metal for EMI immunity.



Features

- ☑ 1510nm DFB Transmitter and APD Receiver
- ☑ 44dB link budget
- ☑ Compatible with SFP MSA
- ☑ Designed for SONET OC-3 (156Mb/s) OSC Application
- ☑ Digital Diagnostics through Serial Interface
- ☑ Internal Calibration for Digital Diagnostics
- ☑ Eye Safe (Class I Laser Safety)
- ☑ Duplex LC Optical Interface
- ☑ Excellent EMI & ESD Protection
- ☑ Hot-pluggable

Absolute Maximum Ratings

Parameter	Symbol	Minimum	Maximum	Units
Storage Temperature	T_{ST}	- 40	+ 85	°C
Operating Case Temperature ¹	T_{OP}	- 5	+70	°C
Supply Voltage	V_{CC}	0	+ 5.0	V
Maximum Input Optical Power	$P_{in, max}$	-	+ 3.0	dBm
Input Voltage	V_{IN}	0	V_{CC}	V

¹Measured on top side of SFP module at the front center vent hole of the cage.

Transmitter Performance Characteristics (Over Operating Case Temperature. $V_{CC} = 3.13$ to $3.47V$)

All parameters guaranteed only at typical data rate

Parameter	Symbol	Minimum	Typical	Maximum	Units
Operating Data Rate ¹	B	-	156	-	Mb/s
Average Optical Output Power (coupled into single mode fiber), 50% duty cycle	P_O	+ 1.0	-	+ 5.0	dBm
Extinction Ratio	P_{hi}/P_{lo}	10	-	-	dB
Center Wavelength	λ_C	1504.5	1510	1517.5	nm
Spectral Width (-20dB)	$\Delta\lambda_{20}$	-	-	1.0	nm
Side Mode Suppression Ratio	$SMSR$	30	-	-	dB
Optical Output Eye	Compliant with Telcordia GR-253-CORE and ITU-T Recommendation G.957				
¹ Data rate ranges from 50Mb/s to 266Mb/s. However, some degradation may be incurred in overall performance.					

Receiver Performance Characteristics (Over Operating Case Temperature. $V_{CC} = 3.13$ to $3.47V$)

All parameters guaranteed only at typical data rate

Parameter	Symbol	Minimum	Typical	Maximum	Units
Operating Data Rate ¹	B	-	156	-	Mb/s
Receiver Sensitivity (10-10 BER) ²	P_{min}	-43.0	-	-	dBm
Maximum Input Optical Power (10 ⁻¹² BER) ²	P_{max}	-7.0	0	-	dBm
LOS Thresholds	Increasing Light Input	P_{los+}	-	-43.0	dBm
	Decreasing Light Input	P_{los-}	-50.0	-	
LOS Hysteresis	-	0.5	-	-	dB
LOS Timing Delay	Increasing Light Input	t_{loss_off}	-	100	μs
	Decreasing Light Input	t_{loss_on}	2.3	100	
Wavelength of Operation	λ	1100	-	1600	nm
Receiver Reflectance	-	-	-	-25.0	dB
¹ Data rate ranges from 50Mb/s to 266Mb/s. However, some degradation may be incurred in overall performance.					
² Measured with 2 ²³ -1 PRBS at 156Mb/s.					

Laser Safety: All transceivers are Class I Laser products per FDA/CDRH and IEC-60825 standards. They must be operated under specified operating conditions.

Oplink Communications, Inc.

DATE OF MANUFACTURE:

MANUFACTURED IN THE USA

This product complies with
21 CFR 1040.10 and 1040.11**Meets Class I Laser Safety Requirements**

Transmitter Performance Characteristics (Over Operating Case Temperature. $V_{CC} = 3.13$ to $3.47V$)

Parameter	Symbol	Minimum	Typical	Maximum	Units
Input Voltage Swing (TD+ & TD-) ¹	V_{PP-DIF}	0.25	-	2.4	V
Input HIGH Voltage (TX Disable) ²	V_{IH}	2.0	-	V_{CC}	V
Input LOW Voltage (TX Disable) ²	V_{IL}	0	-	0.8	V
Output HIGH Voltage (TX Fault) ³	V_{OH}	2.0	-	$V_{CC} + 0.3$	V
Output LOW Voltage (TX Fault) ³	V_{OL}	0	-	0.8	V

¹Differential peak-to-peak voltage.
²There is an internal 4.7 to 10k Ω pull-up resistor to VccT.
³Open collector compatible, 4.7 to 10k Ω pull-up resistor to Vcc (Host Supply Voltage).

Receiver Electrical Interface (Over Operating Case Temperature. $V_{CC} = 3.13$ to $3.47V$)

Parameter	Symbol	Minimum	Typical	Maximum	Units
Output Voltage Swing (RD+ & RD-) ¹	V_{PP-DIF}	0.6	-	2.0	V
Output HIGH Voltage (LOS) ²	V_{OH}	2.0	-	$V_{CC} + 0.3$	V
Output LOW Voltage (LOS) ²	V_{OL}	0	-	0.5	V

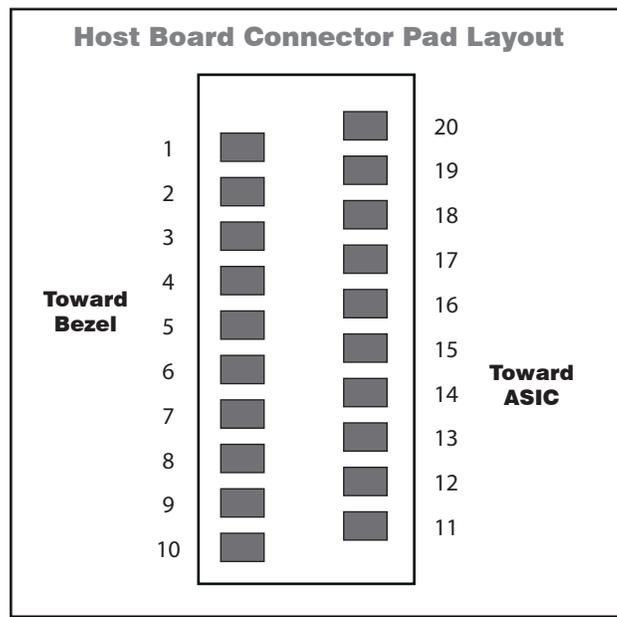
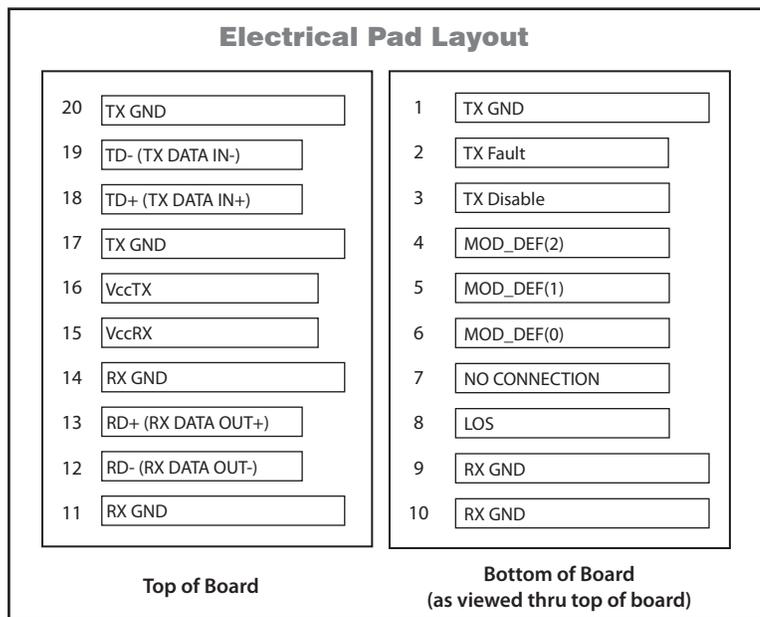
¹Differential peak-to-peak voltage across external 100 Ω load.
²Open collector compatible, 4.7 to 10k Ω pull-up resistor to Vcc (Host Supply Voltage).

Electrical Power Supply Characteristics (Over Operating Case Temperature. $V_{CC} = 3.13$ to $3.47V$)

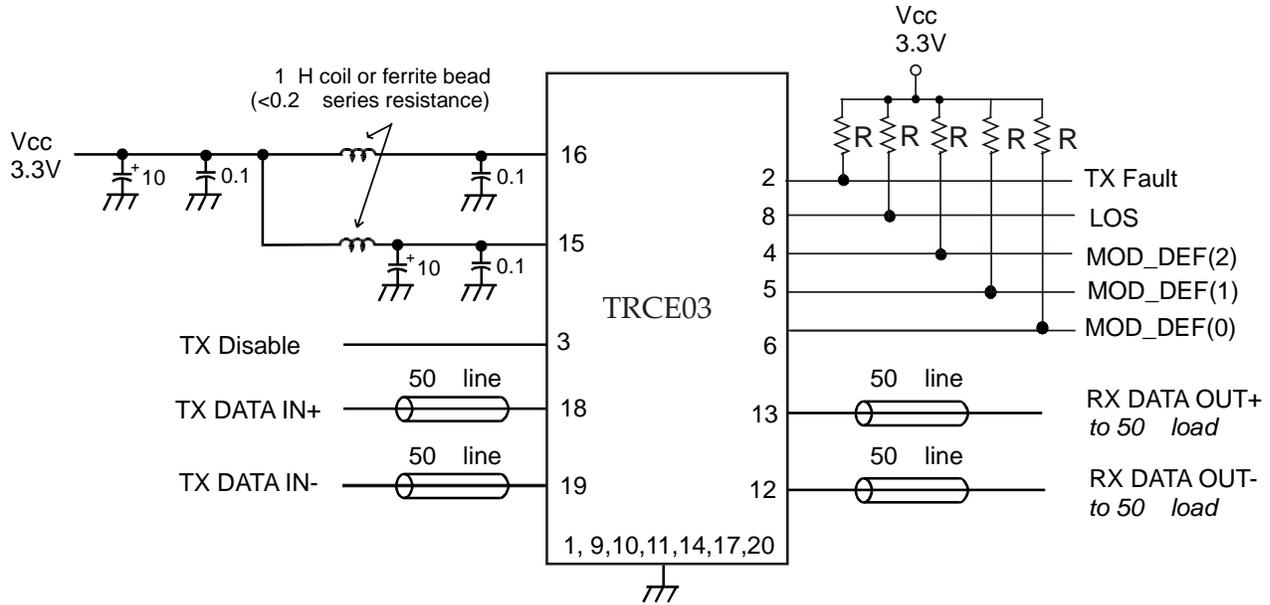
Parameter	Symbol	Minimum	Typical	Maximum	Units
Supply Voltage	V_{CC}	3.13	3.3	3.47	V
Supply Current	I_{CC}	-	175	350	mA

Module Definition

MOD_DEF(0) pin 6	MOD_DEF(1) pin 5	MOD_DEF(2) pin 4	Interpretation by Host
TTL LOW	SCL	SDA	Serial module definition protocol



Example of SFP host board schematic



R: 4.7 to 10k Ω
CAP Values in μ F

Application Notes

Electrical interface: All signal interfaces are compliant with the SFP MSA specification. The high speed DATA interface is differential AC-coupled internally with 1 μ F and can be directly connected to a 3.3V SERDES IC. All low speed control and sense output signals are open collector TTL compatible and should be pulled up with a 4.7 - 10k Ω resistor on the host board

Loss of Signal (LOS): The Loss of Signal circuit monitors the level of the incoming optical signal and generates a logic HIGH when an insufficient photocurrent is produced.

TX_Fault: The output indicates LOW when the transmitter is operating normally, and HIGH with a laser fault including laser end-of-life. TX Fault is an open collector/drain output that should be pulled up with a 4.7 - 10k Ω resistor on the host board. TX Fault is latched per SFP MSA.

TX_Disable: When the TX Disable pin is at logic HIGH, the transmitter optical output is disabled (less than -45dBm).

Serial Identification and Monitoring: The module definition of SFP is indicated by the three module definition pins, MOD_DEF(0), MOD_DEF(1) and MOD_DEF(2).

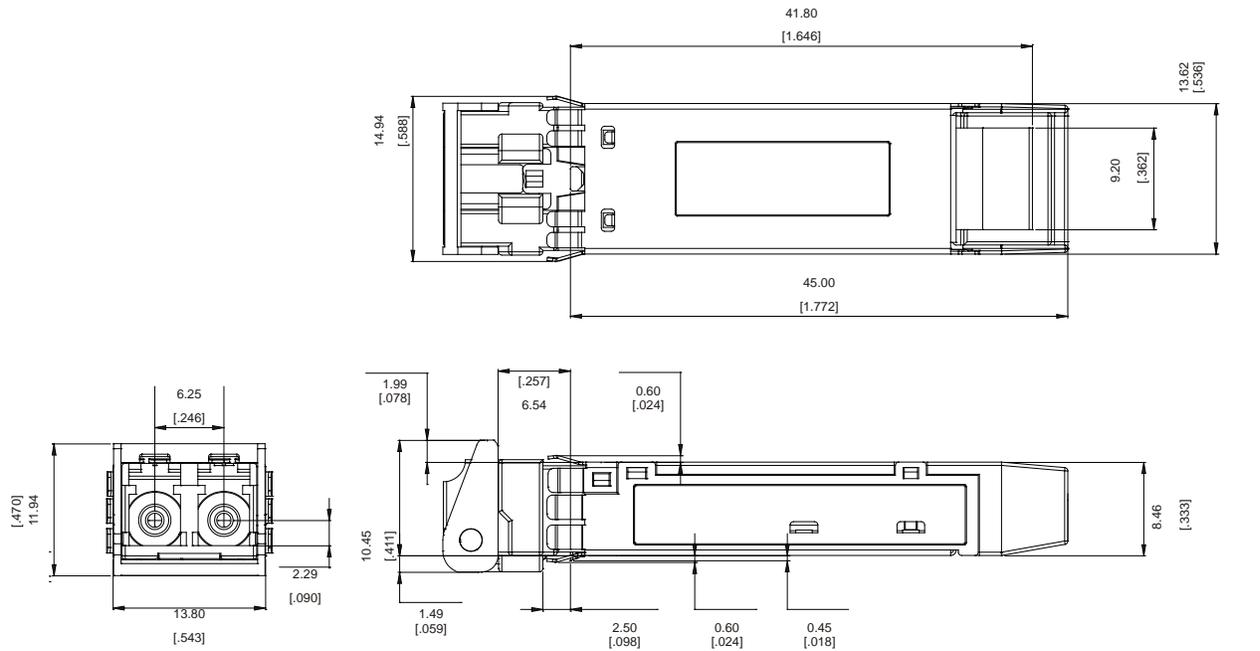
Upon power up, MOD_DEF(1:2) appear as NC (no connection), and MOD_DEF(0) is TTL LOW. When the host system detects this condition, it activates the serial protocol (standard two-wire I²C serial interface) and generates the serial clock signal (SCL). The positive edge clocks data into the EEPROM

segments of the SFP that are not write protected, and the negative edge clocks data from the SFP.

The serial data signal (SDA) is for serial data transfer. The host uses SDA in conjunction with SCL to mark the start and end of serial protocol activation. The supported monitoring functions are internal temperature, supply voltage, bias current, transmitter power, average receiver signal, all alarms and warnings and software monitoring of TX Fault/LOS. The device is internally calibrated.

The data transfer protocol and the details of the mandatory and vendor specific data structures are defined in the SFP MSA, and SFF-8472, Rev. 9.4.

Power supply and grounding: The power supply line should be well-filtered. All 0.1 μ F power supply bypass capacitors should be as close to the transceiver module as possible.

Mechanical Package


Dimensions in inches [mm]
 Default tolerances:
 .xxx = ± .005", .xx = ± .01"

Ordering Information

Model Name	Operation Temperature	Center Wavelength (nm)	Link Budget	Latch Color
TRCE03KE2C000C3	-5°C to +70°C	1510	44dB	Blue