

# 10 Gbps Single Mode Transceiver



## SFP+, Duplex LC Connector, 1310nm DFB LD for Single Mode Fiber, RoHS Compliant

Digital Diagnostics Functions, Extended Operating Temperature from  $-40$  to  $+85^{\circ}\text{C}$



### Features

- 1310nm uncooled DFB LD
- Receiver limiting amplifier
- Data Rate: 8.5Gbps to 11.3Gbps, NRZ
- RoHS Compliant and Lead-free
- Compliant to SFP+ Electrical MSA SFF-8431
- Compliant to SFP+ Mechanical MSA SFF-8432
- Compliant with specifications for IEEE-802.3ae 10GBASE-LR/LW at 10.3125 Gbps
- Compliant with specifications for Fibre Channel 1200-SM-LC-L at 10.51875 Gbps
- Compliant with specifications for Fibre Channel 800-SM-LC-L at 8.5 Gbps
- Digital Diagnostic Monitoring Interface
- Duplex LC Connector
- Transmission distance up to 10km
- Low power consumption  $< 1\text{W}$
- Compliant with Laser Class 1 IEC / CDRH

### Applications

- 10G Fibre Channel Links
- 10Gigabit Ethernet Links
- 8.5 Gb/s Fibre Channel Links

### Description

The CT-A000TPP-NB4L-E from Coretek Opto Corp. is a high performance, optimum heat dissipation and excellent electromagnetic shielding module for serial optical data communication applications specified for single mode of data rate 10.3125 Gb/s. The module is intended for multimode fiber, operates at a nominal wavelength of 1310nm and complies with Multi-Source Agreement (MSA) SFP+. Each module is integrated digital diagnostics functions via an I<sup>2</sup>C serial interface.

The module is a duplex LC connector transceiver designed to provide 10 Gigabit Ethernet compliant link at 10.3 Gb/s and Fibre Channel compliant link at 8.5 and 10.5 Gb/s intermediate reach applications. The characteristics are performed in accordance with IEEE802.3ae and Fibre Channel Physical Interface.

### EMC

Most equipment utilizing high-speed transceivers will be required to meet the following requirements:

- 1) FCC in the United States
- 2) CENELEC EN55022 (CISPR 22) in Europe

To assist the customer in managing the overall equipment EMC performance, the transceivers have been designed to satisfy FCC class B limits and provide good immunity to radio-frequency electromagnetic fields.

## Eye Safety

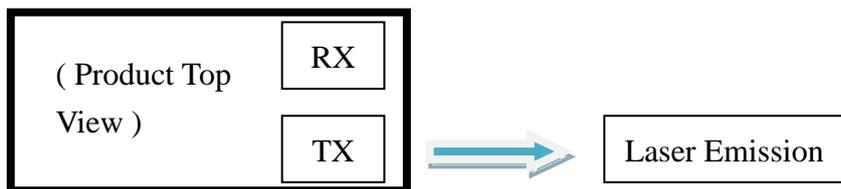
This laser based single mode transceiver is a Class 1 product. It complies with IEC 60825-1 Ed.2: 2007 and FDA performance standards for laser products (21 CFR 1040.10 and 1040.11) except for deviations pursuant to Laser Notice 50, dated June 24, 2007.

### CLASS 1 LASER PRODUCT

### DO NOT VIEW DIRECTLY WITH OPTICAL INSTRUMENTS

Caution: use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation.

*Note: All adjustments have been made at the factory prior to shipment of the devices. No maintenance or alteration to the device is required. Tampering with or modifying the performance of the device will result in voided product warranty. Failure to adhere to the above restrictions could result in a modification that is considered an act of "manufacturing", and will require, under law, recertification of the modified product with the U.S. Food and Drug Administration (ref. 21 CFR 1040.10 (i)).*



Wavelength	> 1310 nm
Maximum total output power (as defined by IEC: 7 mm aperture at 70 mm distance)	< 15.6 mW / 11.9 dBm
Beam divergence (full angle) / NA (half angle)	11° / 0.1 rad

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## Product Information

Model Number	Wavelength	Output Power	Sensitivity	Distance
CT-A000TPP-NB4L-E	1310 nm	-5 ~ 0 dBm	$\leq -14$ dBm	10km

## ABSOLUTE MAX RATINGS

PARAMETER	SYMBOL	MIN	MAX	UNIT	NOTE
Storage Temperature	$T_s$	-40	85	$^{\circ}\text{C}$	
Supply Voltage	$V_{CC}$	-0.5	3.6	V	
Relative Humidity	RH	0	85	%	

## OPERATING CONDITIONS

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	NOTE
Case Operating Temperature	$T_C$	-40		85	$^{\circ}\text{C}$	
Supply Voltage	$V_{CC}$	3.14	3.30	3.47	V	
Supply Current	$I_{CC}$			350	mA	
Data Rate		8.5	10.3125	11.3	Gb/s	

## ELECTRICAL CHARACTERISTICS

PARAMETER	SYMBOL	MIN	MAX	UNIT	NOTE
<b>Transmitter</b>					
Data Input Differential Voltage	$V_{ID}$	180	700	mV	
Tx_Disable Input Voltage - Low	$V_{IL}$	-0.3	0.8	V	
Tx_Disable Input Voltage - High	$V_{IH}$	2.0	$V_{CC} + 0.3$	V	
Tx_Fault Output Voltage - Low	$V_{OL}$	-0.3	0.4	V	
Tx_Fault Output Current - High	$I_{OH}$	-50	37.5	$\mu\text{A}$	1
<b>Receiver</b>					
Data Output Differential Voltage	$V_{OD}$	300	850	mV	2
Rx_LOS Output Voltage - Low	$V_{OL}$	-0.3	0.4	V	
Rx_LOS Output Current - High	$I_{OH}$	-50	37.5	$\mu\text{A}$	1
SDA, SCL - Low	$V_{IL}$	-0.3	$V_{CC} \times 0.3$	V	
SDA, SCL - High	$V_{IH}$	$V_{CC} \times 0.7$	$V_{CC} + 0.5$	V	

## TRANSMITTER ELECTRO-OPTICAL CHARACTERISTICS

PARAMETER	SYMBOL	MIN	TYP.	MAX	UNIT	NOTE
Optical Output Power (average)	$P_o$	-5		0	dBm	
Extinction Ratio	ER	3.5			dB	
Center Wavelength	$\lambda_c$	1260		1360	nm	
Spectral Width (RMS)	$\Delta \lambda$			3	nm	
Side Mode Suppression Ratio	SMSR	30			dB	
Transmitter OFF Power	$P_{off}$			-30	dBm	

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## RECEIVER ELECTRO-OPTICAL CHARACTERISTICS

PARAMETER	SYMBOL	MIN	TYP.	MAX	UNIT	NOTE
Maximum Input Optical Power	$P_{max}$	2.5			dBm	
Receiver Sensitivity	$P_{min}$			-14	dBm	3
LOS of Signal - Deasserted	$P_D$			-20	dBm	
LOS of Signal - Asserted	$P_A$	-23			dBm	
LOS of Signal - Hysteresis	Hys	0.5			dB	
Operating Wavelength	$\lambda$	1260		1600	nm	

### Notes:

1. Measured with a  $4.7k\Omega$  load pulled up to  $V_{cc\_Host}$
2. Into  $100\Omega$  differential termination
3. Measured with  $2^{31}-1$  PRBS at  $BER < 10^{-12}$

## TIMING CHARACTERISTICS

PARAMETER	SYMBOL	MIN	TYP.	MAX	UNIT	NOTE
TX_DISABLE Assert Time	$t_{off}$			10	$\mu s$	
TX_DISABLE Negate Time	$t_{on}$			2	ms	
Time to initialize, include reset of TX_FAULT	$t_{init}$			300	ms	
TX_FAULT from fault to assertion	$t_{fault}$			100	$\mu s$	
TX_DISABLE time to start reset	$t_{reset}$	10			$\mu s$	
Receiver Loss of Signal Assert Time (off to on)	$t_{A,RX\_LOS}$			100	$\mu s$	
Receiver Loss of Signal Assert Time (on to off)	$t_{D,RX\_LOS}$			100	$\mu s$	

## DIGITAL DIAGNOSTIC MONITOR ACCURACY

	Low Alarm	Low Warn	High Warn	High Alarm
Temperature	-13°C	-8°C	85°C	88°C
Voltage	2.9V	3V	3.6V	3.7V
Tx Bias	15mA	20mA	80mA	85mA
Tx Power	-8dBm	-7dBm	1dBm	2dBm
Rx Power	-17dBm	-15dBm	2dBm	2.5dBm

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## PIN OUT DIAGRAM OF TRANSCEIVER

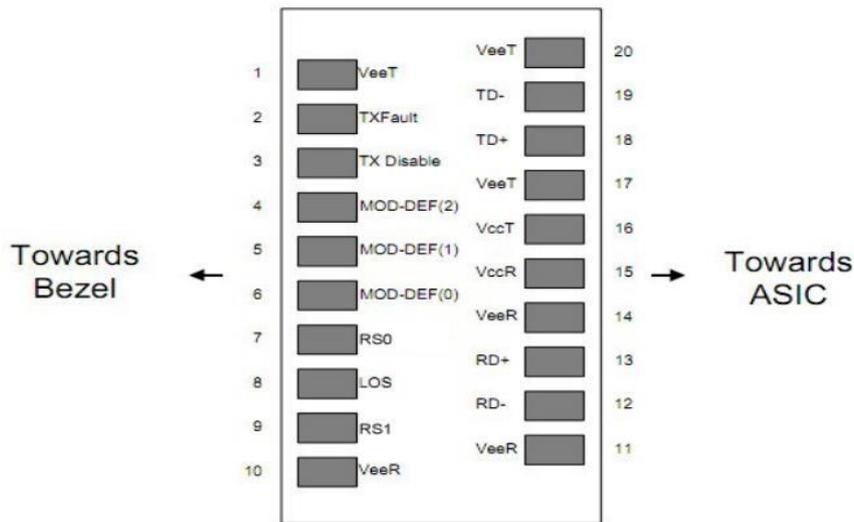


Diagram of Host Board Connector Block Pin Numbers and Names

## PIN OUT TABLE

Pin	Symbol	Description	Ref.
1	VEET	Transmitter Ground (Common with Receiver Ground)	7.1
2	TFAULT	Transmitter Fault. Not supported.	
3	TDIS	Transmitter Disable. Laser output disabled on high or open.	7.2
4	MOD_DEF(2)	Module Definition 2. Data line for Serial ID.	7.3
5	MOD_DEF(1)	Module Definition 1. Clock line for Serial ID.	7.3
6	MOD_DEF(0)	Module Definition 0. Grounded within the module.	7.3
7	RS0	Rate Select0, optionally controls SFP+ module receiver. When high input signaling rate > 4.25 GBd and when low input signaling rate < 4.25 GBd	
8	LOS	Loss of Signal indication. Logic 0 indicates normal operation.	7.4
9	RS1	Rate Select1, optionally controls SFP+ module receiver. When high input signaling rate > 4.25 GBd and when low input signaling rate < 4.25 GBd	
10	VEER	Receiver Ground (Common with Transmitter Ground)	7.1
11	VEER	Receiver Ground (Common with Transmitter Ground)	7.1
12	RD-	Receiver Inverted DATA out. AC Coupled.	
13	RD+	Receiver Non-inverted DATA out. AC Coupled.	
14	VEER	Receiver Ground (Common with Transmitter Ground)	7.1
15	VCCR	Receiver Power Supply	
16	VCCT	Transmitter Power Supply	
17	VEET	Transmitter Ground (Common with Receiver Ground)	7.1
18	TD+	Transmitter Non-Inverted DATA in. AC Coupled.	
19	TD-	Transmitter Inverted DATA in. AC Coupled.	
20	VEET	Transmitter Ground (Common with Receiver Ground)	7.1

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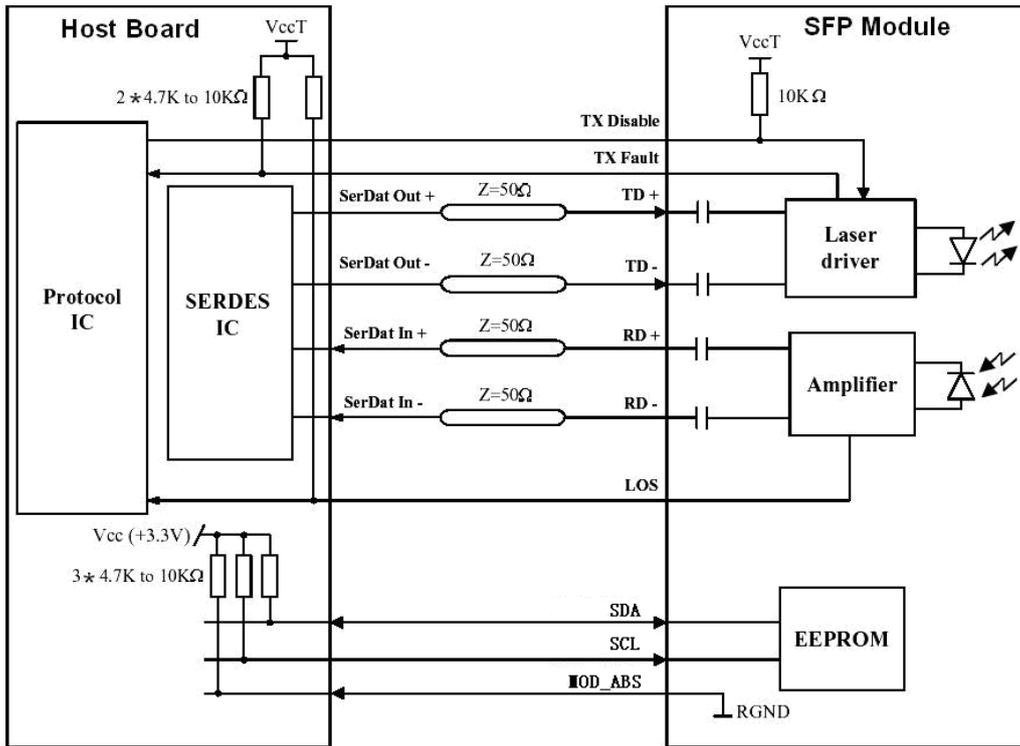


## Notes:

- 7.1 Circuit ground is internally isolated from chassis ground.
- 7.2 Laser output disabled on TDIS >2.0V or open, enabled on TDIS <0.8V.
- 7.3 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.
- 7.4 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.

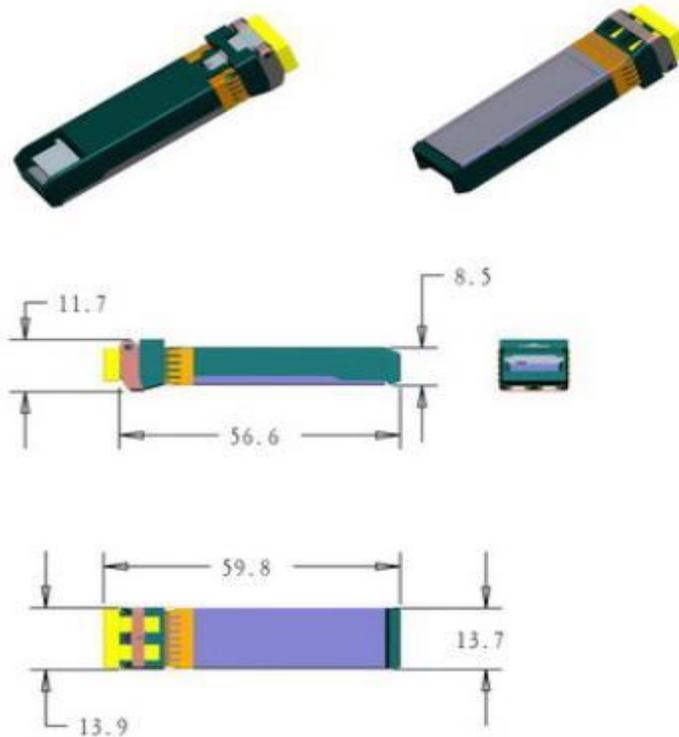
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## RECOMMENDED CIRCUIT SCHEMATIC



## MECHANICAL DIMENSIONS

Units in mm



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