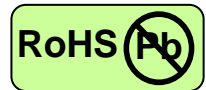


10 Gb/s Multi-mode Transceiver



SFP+, Duplex LC Connector, 850 nm VCSEL for Multi-mode Fiber, RoHS Compliant

Digital Diagnostics Functions, Extended Operating Temperature from -40 to +85 °C



Features

- 850 nm VCSEL
- Receiver - limiting amplifier
- Data Rate: 8.5 Gb/s to 11.3 Gb/s, NRZ
- RoHS Compliant and Lead-free
- Compliant to SFP+ Electrical MSA SFF-8431
- Compliant to SFP+ Mechanical MSA SFF-8432
- Compliance with specifications for IEEE-802.3ae 10GBASE-SR/SW at 10.3125 Gb/s
- Compliance with specifications for Fibre Channel 1200-Mx-SN-1 at 10.51875 Gb/s
- Compliance with specifications for Fibre Channel 800-M5/M6/M5E-LC-I at 8.5 Gb/s
- Digital Diagnostic Monitoring Interface
- Duplex LC Connector
- Transmission distance up to 300 m (OM3 fiber)
- Low power consumption < 1W
- 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-A000NPP-SB1L-E from Coretek Opto Corp. is a high performance module, with optimum heat dissipation and excellent electromagnetic shielding, for serial optical data communication applications specified for a data rate 10.3125 Gb/s. The module is intended for multi-mode fiber, operates at a nominal wavelength of 850 nm and complies with Multi-Source Agreement (MSA) SFP+. Each module is integrated with digital diagnostics functions via an I²C 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 Gb/s and 10.5 Gb/s short 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

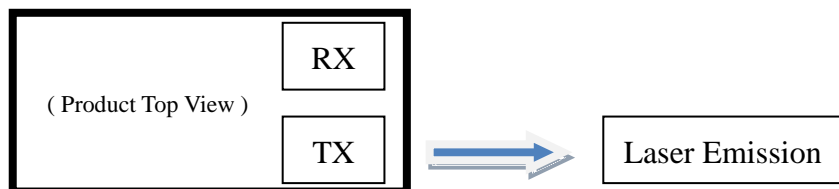
This laser based multi-mode transceiver is a Class 1 product. It complies with IEC 60825-1 Ed.2: 2007 and FDA performance standards for laser products (21 CFR 1040.10 and 1040.11) except for deviations pursuant to Laser Notice 50, dated June 24, 2007.

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 > 840 nm
Accessible Emission Limit < 743 μ W
(as defined by IEC: 7 mm aperture at 70 mm distance)

10 Gb/s Multi-mode Transceiver



Product Information

Model Number	Wavelength	Output Power	Sensitivity	Distance
CT-A000NPP-SB1L-E	850 nm	-5 ~ -1 dBm	≤ -11.1 dBm	82 m for 50/125 μ m (500MHz*km) 300 m for 50/125 μ m (2000MHz*km)

ABSOLUTE MAX RATINGS

PARAMETER	SYMBOL	MIN	MAX	UNIT	NOTE
Storage Temperature	T _S	-40	85	°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	°C	
Supply Voltage	V _{CC}	3.14	3.30	3.47	V	
Supply Current	I _{CC}			300	mA	
Data Rate			10.3125		Gb/s	

ELECTRICAL CHARACTERISTICS

PARAMETER	SYMBOL	MIN	MAX	UNIT	NOTE
Transmitter					
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	μ A	1
Receiver					
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	μ A	1
SDA, SCL - Low	V _{IL}	-0.3	V _{CC} × 0.3	V	
SDA, SCL - High	V _{IH}	V _{CC} × 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		-1	dBm	
Optical Output Power	OMA	-4.3			dBm	
Center Wavelength	λ_c	840	850	860	nm	
Spectral Width (RMS)	$\Delta \lambda$			0.45	nm	
Transmitter OFF Power	P _{off}			-30	dBm	
Transmitter Dispersion Penalty	TDP			3.9	dB	
Extinction Ratio	ER	3			dB	
Relative Intensity Noise(OMA)	RIN			-128	dB/Hz	

10 Gb/s Multi-mode Transceiver



RECEIVER ELECTRO-OPTICAL CHARACTERISTICS

PARAMETER	SYMBOL	MIN	TYP.	MAX	UNIT	NOTE
Maximum Input Optical Power	P_{max}	-1			dBm	
Receiver Sensitivity (OMA)	P_{min}			-11.1	dBm	3
Stressed Receiver Sensitivity (OMA)	P_{min}			-7.5	dBm	
LOS of Signal - Deasserted	P_D			-11	dBm	
LOS of Signal - Asserted	P_A	-30			dBm	
LOS of Signal - Hysteresis	Hys	0.5			dB	
Reflectance	RL			-12	dB	
Operating Wavelength	λ	840		860	nm	

Notes:

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

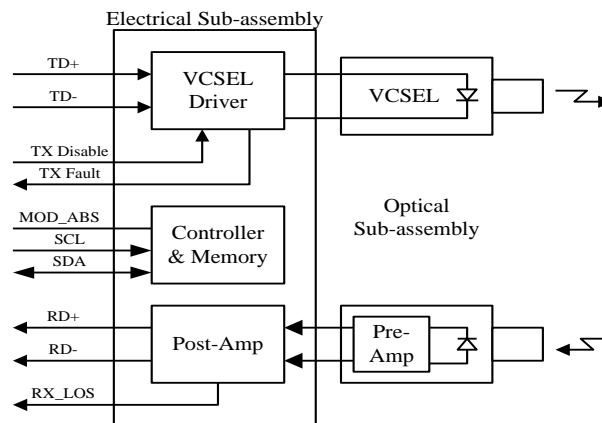
TIMING CHARACTERISTICS

PARAMETER	SYMBOL	MIN	TYP.	MAX	UNIT	NOTE
TX_DISABLE Assert Time	t_off			10	μ 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	μ s	
TX_DISABLE time to start reset	t_reset	10			μ s	
Receiver Loss of Signal Assert Time (off to on)	t _{A,RX LOS}			100	μ s	
Receiver Loss of Signal Assert Time (on to off)	t _{D,RX LOS}			100	μ s	

DIGITAL DIAGNOSTIC MONITOR ACCURACY

PARAMETER	SYMBOL	MIN	MAX	UNIT	NOTE
Transceiver Temperature	T	-3	+3	$^{\circ}$ C	
Power Supply Voltage	V	-3	+3	%	
TX Bias Current	Tx_I	-10	+10	%	
TX Optical Power	Tx_PWR	-2	+2	dB	
RX Optical Power	Rx_PWR	-3	+3	dB	

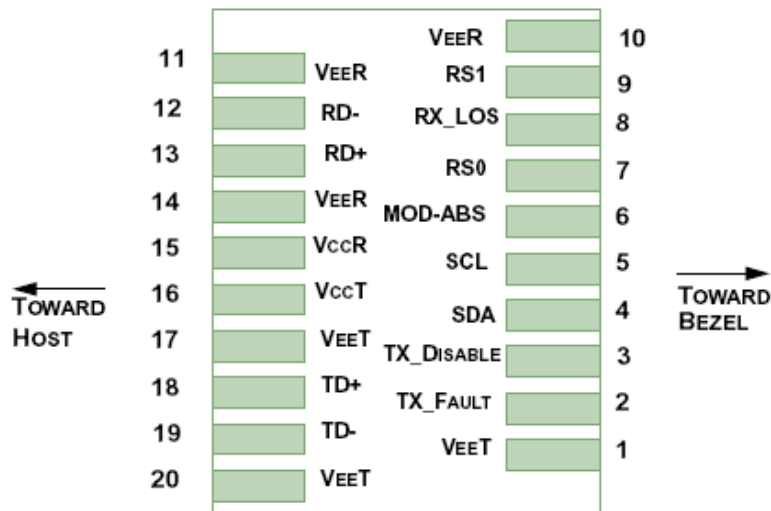
BLOCK DIAGRAM OF TRANSCEIVER



10 Gb/s Multi-mode Transceiver



PIN OUT DIAGRAM OF TRANSCEIVER



PIN OUT TABLE

Pin	Symbol	Logic	Functional Description	Note
1	V _{EE} T		Transmitter Ground	1
2	TX_FAULT	LVTTL-O	Transmitter Fault Indication	2
3	TX_DISABLE	LVTTL-I	Transmitter Disable – Module disables on high or open	3
4	SDA	LVTTL-I/O	Two wire serial ID interface data line	4
5	SCL	LVTTL-I/O	Two wire serial ID interface clock	4
6	MOD-ABS		Module absent, connect to V _{ee} T or V _{ee} R in the module	5
7	RS0		No connection required	
8	RX_LOS	LVTTL-O	Loss of Signal	2
9	RS1		No connection required	
10	V _{EE} R		Receiver Ground	1
11	V _{EE} R		Receiver Ground	1
12	RD-	CML-O	Inverse Received Data Out	
13	RD+	CML-O	Received Data Out	
14	V _{EE} R		Receiver Ground	1
15	V _{CC} R		Receiver Power	
16	V _{CC} T		Transmitter Power	
17	V _{EE} T		Transmitter Ground	1
18	TD+	CML-I	Transmitter Data In	
19	TD-	CML-I	Inverse Transmitter Data In	
20	V _{EE} T		Transmitter Ground	1

Notes:

1. Module ground pins GND are isolated from the module case and chassis ground within the module.
2. This is an open collector/drain output that on the host board requires a 4.7-10k Ω pull-up resistor to V_{cc}_Host.
3. This is an input contact with a 4.7-10k Ω pull-up to V_{cc} inside the module.
4. Two-wire serial interface clock and data lines require an external pull-up resistor dependant on the capacitance load.
5. This is a ground return that on the host board requires a 4.7-10k Ω pull-up resistor to V_{cc}_Host.

10 Gb/s Multi-mode Transceiver



EEPROM Serial ID Memory Contents

Table 1 - EEPROM Serial ID Memory Contents (A0h)

Addr.	Field Size (Bytes)	Name of Field	Hex	Description
00	1	Identifier	03	SFP
01	1	Ext. Identifier	04	SFP function is defined by two-wire interface ID only
02	1	Connector	07	LC
03 ~ 10	8	Transceiver Codes	10 00 00 00 00 00 00 00	
11	1	Encoding	06	
12	1	BR,nominal	67	10Gbps
13	1	Reserved	00	
14	1	Length (SMF)-km	00	
15	1	Length (SMF)-100m	00	
16	1	Length (50um,OM2)	08	
17	1	Length (62.5um,OM1)	03	
18	1	Length (copper)	00	
19	1	Length (50um, OM3)	1E	
20 ~ 35	16	Vendor Name	43 4F 52 45 54 45 4B 20 20 20 20 20 20 20 20 20	CORETEK
36	1	Unallocated	00	
37 ~ 39	3	OUI Code	00 00 00	
40 ~ 55	16	Vendor PN	43 54 2D 41 30 30 30 4E 50 50 2D 53 42 31 4C 45	CT-A000NPP-SB1LE
56 ~ 59	4	Vendor Rev	31 20 20 20	1000
60 ~ 61	2	Wavelength	03 52	850nm
62	1	Reserved	00	
63	1	CC BASE	XX	Check sum
64 ~ 65	2	Options	00 1A	LOS, TX_FAULT and TX_DISABLE
66	1	BR max	0A	
67	1	BR min	11	
68 ~ 83	16	Vendor SN	XXXXXXXXXXXXXXXXXXXX	
84 ~ 91	8	Date code		

6.

10 Gb/s Multi-mode Transceiver



92	1	Diagnostic Monitoring Type	68	
93	1	Enhanced Options	B0	
94	1	SFF-8472	04	
95	1	CC BASE	XX	Check sum
96 ~ 127	32	Vendor Specific		

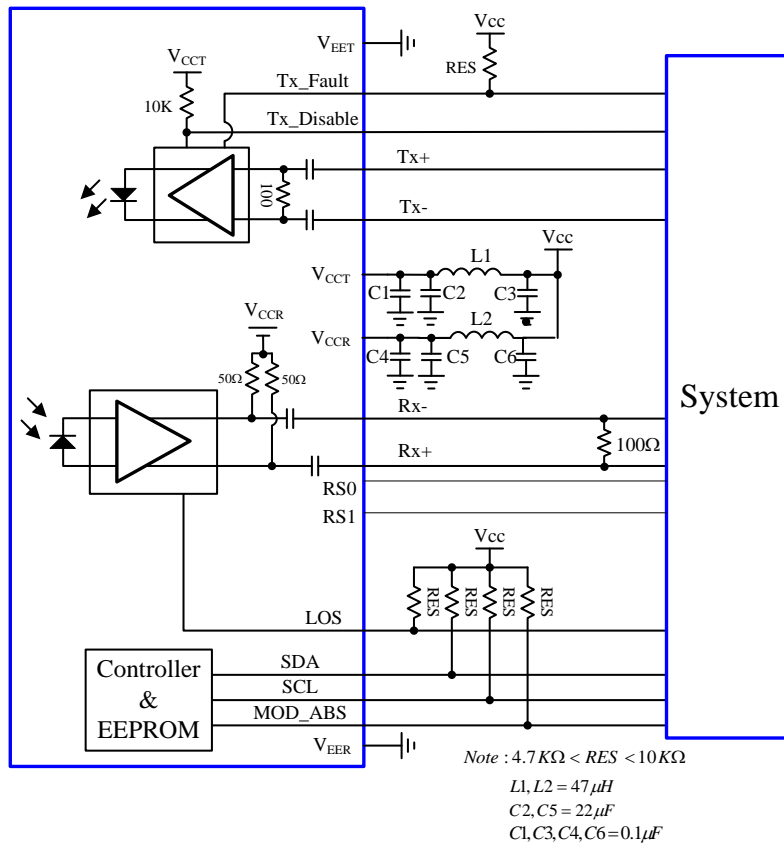
Table 2- EEPROM Serial ID Memory Contents (A2h)

Addr.	Field Size (Bytes)	Name of Field	Hex	Description
00 ~ 07	8	Temperature Alarm/Warning (°C)	64 00 D8 00 5F 00 DD 00	Alarm_H/L : 100/-40 Warning_H/L : 95/-35
08 ~ 15	8	Voltage Alarm/Warning (V)	8A AC 75 30 88 B8 79 18	Alarm_H/L : 3.55/3 Warning_H/L : 3.5/3.1
16 ~ 23	8	BiasCurrent Alarm/Warning (mA)	11 C6 05 B4 11 3A 06 4F	Alarm_H/L : 9.1/2.92 Warning_H/L : 8.82/3.23
24 ~ 31	8	Tx Power Alarm/Warning (dBm)	31 2D 04 EB 2B D4 05 85	Alarm_H/L : -0.5/-5 Warning_H/L : -1/-4.5
32 ~ 39	8	Rx Power Alarm/Warning (dBm)	22 D1 02 77 1F 07 03 1A	Alarm_H/L : -0.5/-12 Warning_H/L : -1/-11

10 Gb/s Multi-mode Transceiver

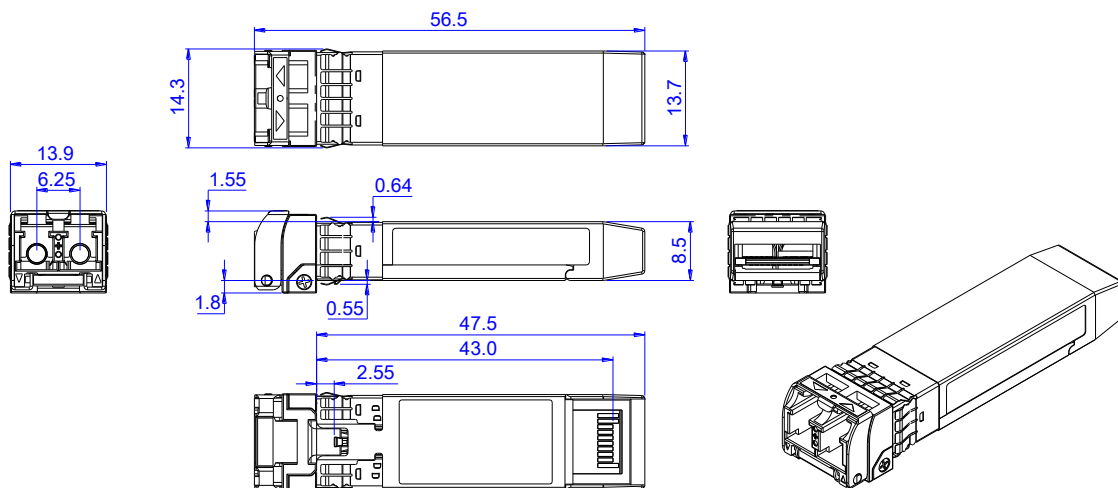


RECOMMENDED CIRCUIT SCHEMATIC



MECHANICAL DIMENSIONS

Units in mm



All dimensions are $\pm 0.2\text{mm}$ unless otherwise specified.

Claim:

CORETEK Opto Corp. reserves the right to make changes in the specification described hereinafter without prior notice.