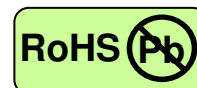


## 4.25 Gb/s Fibre Channel Single Mode Transceiver



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

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



#### Features

- 1310 nm DFB LD
- Multi-rate: from 1.25 to 4.25 Gb/s, NRZ, with Rate Select
- Single +3.3V Power Supply
- RoHS Compliant and Lead-free
- AC/AC Differential Electrical Interface
- Compliant with Multi-Source Agreement (MSA) Small Form Factor Pluggable (SFP)
- Compliant with SFF-8472 Digital Diagnostic Monitoring Interface
- Duplex LC Connector
- Compliance with ANSI specifications for Fibre Channel applications
- Compliance with specifications for 10GBASE LX-4 at 3.125 Gb/s
- Compliance with specifications for IEEE-802.3z Gigabit Ethernet at 1.25 Gb/s
- Eye Safety
  - Designed to meet Laser Class 1 comply with EN60825-1
- Firmware version:
  - SFP\_4G\_LRMR-071317

#### Applications

- Fibre Channel Links
- 10GBASE LX-4
- Gigabit Ethernet

#### Description

The CT-4250TSP-NE4L-E GD from Coretek Opto Corp. is a high performance and cost-effective module for serial optical data communication applications specified for multi-rate from 1.25 to 4.25 Gb/s. It operates with +3.3 V power supply. The module is intended for single mode fiber, operates at a nominal wavelength of 1310nm and complies with Multi-Source Agreement (MSA) Small Form Factor Pluggable (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 Gigabit Ethernet compliant link at 1.25 Gb/s, 10GBASE LX-4 compliant link at 3.125 Gb/s, and Fibre Channel compliant link at 4.25 Gb/s medium reach applications. The characteristics are performed in accordance with ANSI Fibre Channel Physical Interface (FC-PI-2) Rev 7.0

#### 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

The transceivers have been designed to meet Class 1 eye safety and comply with EN 60825-1.

# 4.25 Gb/s Fibre Channel Single Mode Transceiver



## Product Information

Model Number	Operating Voltage & SD Output	Wavelength	Output Power	Sensitivity	Distance
CT-4250TSP-NE4L-E GD	3.3 V TTL	1310 nm DFB	-7 ~ -3 dBm	≤ 18 dBm	10 km for 4.25 Gb/s 10 km for 3.125 Gb/s 20 km for 1.25 Gb/s

## ABSOLUTE MAX RATINGS

PARAMETER	SYMBOL	MIN	MAX	UNIT	NOTE
Storage Temperature	T <sub>S</sub>	-40	85	°C	
Supply Voltage	V <sub>CC</sub>	-0.5	4.0	V	
Data Input Voltage	---	0	V <sub>CC</sub>	V	
Supply Current	I <sub>S</sub>		300	mA	

## OPERATING CONDITIONS

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	NOTE
Case Operating Temperature	T <sub>A</sub>	-40		85	°C	
Supply Voltage	V <sub>CC</sub>	3.0	3.3	3.6	V	
Data Input Voltage Swing	V <sub>ID</sub>	100		1200	mV	

## ELECTRICAL CHARACTERISTICS

PARAMETER	SYMBOL	MIN	MAX	UNIT	NOTE
<b>Input</b>					
MOD_DEF (1), MOD_DEF (2), Tx_Disable, Rate Select - Low	V <sub>IL</sub>	0	0.8	V	
MOD_DEF (1), MOD_DEF (2), Tx_Disable, Rate Select - High	V <sub>IH</sub>	2.0	V <sub>CC</sub>	V	
<b>Output</b>					
TX_Fault, LOS , MOD_DEF (2) - Low	V <sub>OL</sub>	0	0.8	V	
TX_Fault, LOS , MOD_DEF (2) -High	V <sub>OH</sub>	2.0	V <sub>CC</sub>	V	

## TRANSMITTER ELECTRO-OPTICAL CHARACTERISTICS

PARAMETER	SYMBOL	MIN	TYP.	MAX	UNIT	NOTE
Optical Output Power	P <sub>O</sub>	-7		-3	dBm	1
Optical Modulation Amplitude	OMA	290			μW	
Extinction Ratio	ER	9			dB	
Center Wavelength	λ <sub>c</sub>	1290	1310	1325	nm	
Spectral Width (-20dB)	Δλ			1	nm	
Side Mode Suppression Ratio	SMSR	30			dB	
RIN	RIN			-120	dB/Hz	
Optical Rise time (20%-80% )	t <sub>r</sub>			120	psec	2
Optical Fall time (20%-80% )	t <sub>f</sub>			120	psec	2

## 4.25 Gb/s Fibre Channel Single Mode Transceiver



### RECEIVER ELECTRO-OPTICAL CHARACTERISTICS

PARAMETER	SYMBOL	MIN	TYP.	MAX	UNIT	NOTE
Maximum Input Optical Power	$P_{max}$	0			dBm	3
Minimum Input Optical Power	$P_{min}$	4.25 Gb/s		-18	dBm	3
		3.125 Gb/s		-18		
		1.25 Gb/s		-21		
Operating Wavelength	$\lambda$	1100		1600	nm	
Optical Return Loss	ORL	12			dB	
Loss of Signal – Asserted	$P_A$	-35			dBm	4
Loss of Signal – Deasserted	$P_D$			-20	dBm	5
Loss of Signal –Hysterisis	$P_D - P_A$	0.5			dB	

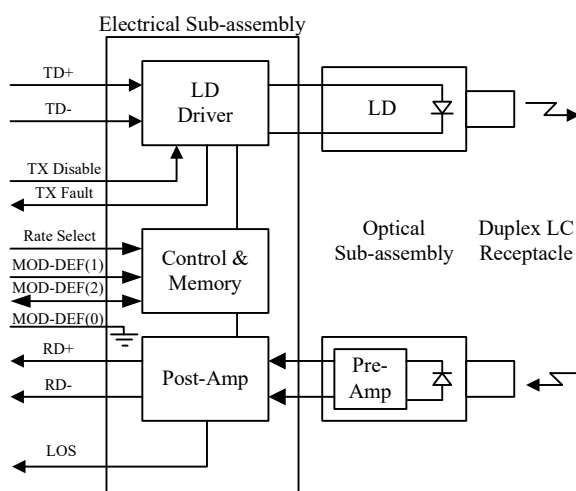
#### Notes:

1. Measured average power coupled into 9/125  $\mu$ m single mode fiber.
2. These are 20-80% values.
3. Measured with  $2^7-1$  PRBS at  $BER < 10^{-12}$
4. Measured on transition – low to high.
5. Measured on transition – high to low.

### TIMING CHARACTERISTICS

PARAMETER	SYMBOL	MIN	TYP.	MAX	UNIT	NOTE
TX_DISABLE Assert Time	$t_{off}$			10	$\mu$ s	
TX_DISABLE Negate Time	$t_{on}$			1	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	

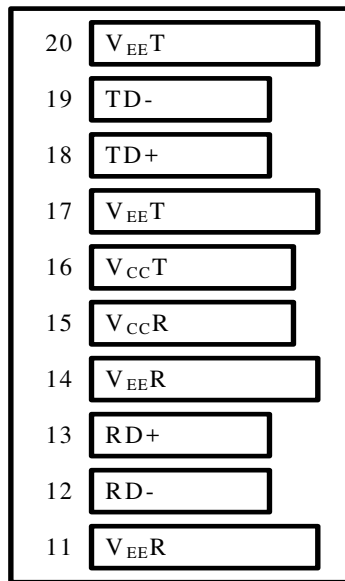
### BLOCK DIAGRAM OF TRANSCEIVER



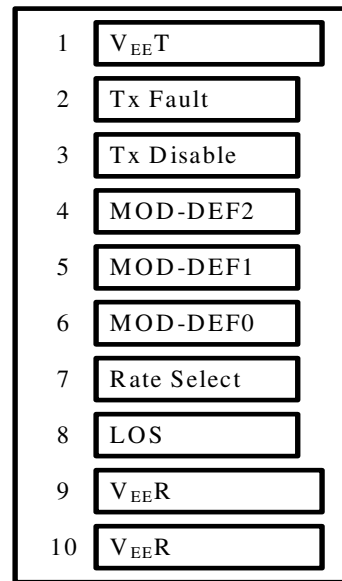
# 4.25 Gb/s Fibre Channel Single Mode Transceiver



## PIN OUT DIAGRAM OF TRANSCEIVER



Top of Board



Bottom of Board (As Viewed through Top of Board)

## PIN OUT TABLE

Pin	Symbol	Functional Description
1	V <sub>ee</sub> T	Transmitter Ground
2	TX Fault	Transmitter Fault Indication
3	TX Disable	Transmitter Disable – Module disables on high or open
4	MOD-DEF(2)	Module Definition 2 – Two wire serial ID interface
5	MOD-DEF(1)	Module Definition 1 – Two wire serial ID interface
6	MOD-DEF(0)	Module Definition 0 – Grounded in module
7	Rate Select	Open or Low = 1.25 Gb/s Gigabit Ethernet (Low Bandwidth) High = 4.25 Gb/s Fibre Channel & 3.125 Gb/s 10GBASE LX-4 (High Bandwidth)
8	LOS	Loss of Signal
9	V <sub>ee</sub> R	Receiver Ground
10	V <sub>ee</sub> R	Receiver Ground
11	V <sub>ee</sub> R	Receiver Ground
12	RD-	Inverse Received Data Out
13	RD+	Received Data Out
14	V <sub>ee</sub> R	Receiver Ground
15	V <sub>cc</sub> R	Receiver Power
16	V <sub>cc</sub> T	Transmitter Power
17	V <sub>ee</sub> T	Transmitter Ground
18	TD+	Transmitter Data In
19	TD-	Inverse Transmitter Data In
20	V <sub>ee</sub> T	Transmitter Ground

## 4.25 Gb/s Fibre Channel Single 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	MOD4
02	1	Connector	07	LC
03 ~ 10	8	Transceiver Codes	00 00 00 02 10 10 01 15	
11	1	Encoding	01	8B/10B
12	1	BR, Nominal	2A	4200 Mbit/s
13	1	Reserved	00	
14	1	Length (SMF)-km	0A	10km
15	1	Length (SMF)-100m	64	10000m
16	1	Length (50 $\mu$ m, OM2)	00	
17	1	Length (62.5 $\mu$ m, OM1)	00	
18	1	Length (copper)	00	
19	1	Length (50 $\mu$ m, OM3)	00	
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 34 32 35 30 54 53 50 4E 45 34 4C 45 47 44	CT4250TSPNE4LEGD
56 ~ 59	4	Vendor Rev	30 30 30 31	0001
60 ~ 61	2	Wavelength	05 1E	1310 nm
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	00	
67	1	BR min	00	
68 ~ 83	16	Vendor SN		
84 ~ 91	8	Date code		

## 4.25 Gb/s Fibre Channel Single Mode Transceiver



92	1	Diagnostic Monitoring Type	68	
93	1	Enhanced Options	90	
94	1	SFF-8472	01	Rev 9.3 of SFF-8472 Compliance
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)	6E 00 D8 00 64 00 DD 00	Alarm_H/L : 110/-40 Warning_H/L : 100/-35
08 ~ 15	8	Voltage Alarm/Warning (V)	8C A0 75 30 88 B8 79 18	Alarm_H/L : 3.6/3 Warning_H/L : 3.5/3.1
16 ~ 23	8	Bias Current Alarm/Warning (mA)	9C 40 03 E8 88 B8 07 D0	Alarm_H/L : 80/2 Warning_H/L : 70/4
24 ~ 31	8	Tx Power Alarm/Warning (dBm)	18 A6 06 31 13 94 07 CB	Alarm_H/L : -2/-8 Warning_H/L : -3/-7
32 ~ 39	8	Rx Power Alarm/Warning (dBm)	27 10 00 9E 1F 07 00 C8	Alarm_H/L : 0/-18 Warning_H/L : -1/-17

**Table - Monitoring Specification**

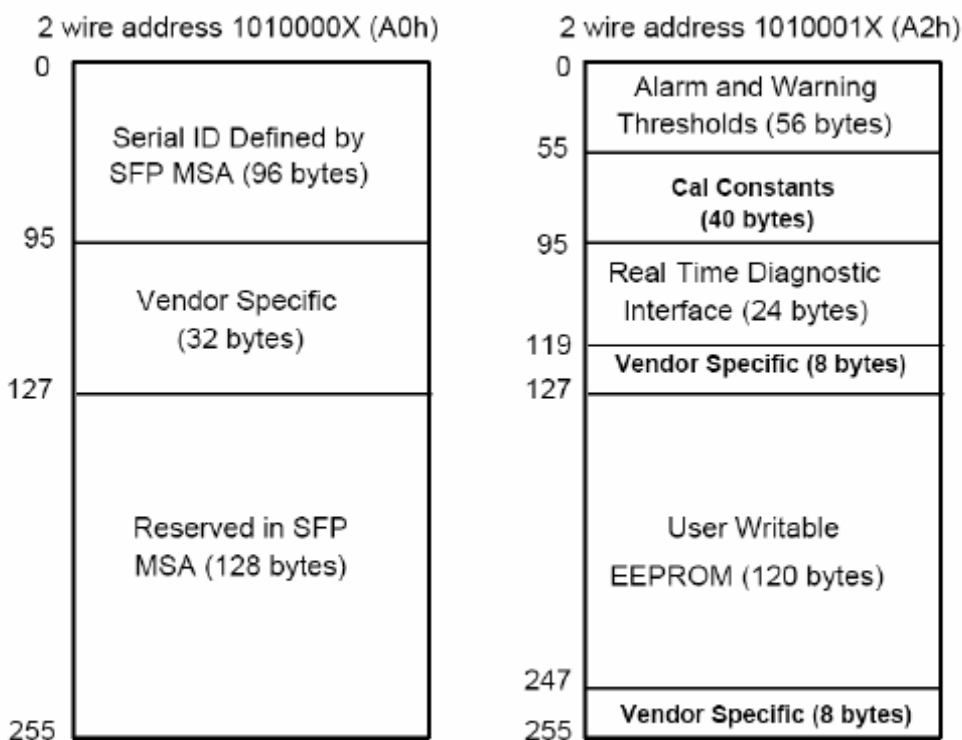
Parameter	Range	Accuracy	Calibration
Temperature	-40°C to 85°C	±3°C	Internal
Voltage	3.0 to 3.6 V	±3%	Internal
Bias Current	0 to 80 mA	±10%	Internal
TX Power	-7 to -3 dBm	±3 dB	Internal
RX Power	-18 to 0 dBm	±3 dB	Internal

## Monitoring Specification

The digital diagnostic monitoring interface also defines another 256-byte memory map in EEPROM, which makes use of the 8 bit address 1010001X (A2h). Please see Figure 1. For detail EEPROM information, please refer to the related document of SFF-8472 Rev 9.5. The monitoring specification of this product is described in Table 3.

**Figure 3.1: Digital Diagnostic Memory Map**

### Specific Data Field Descriptions

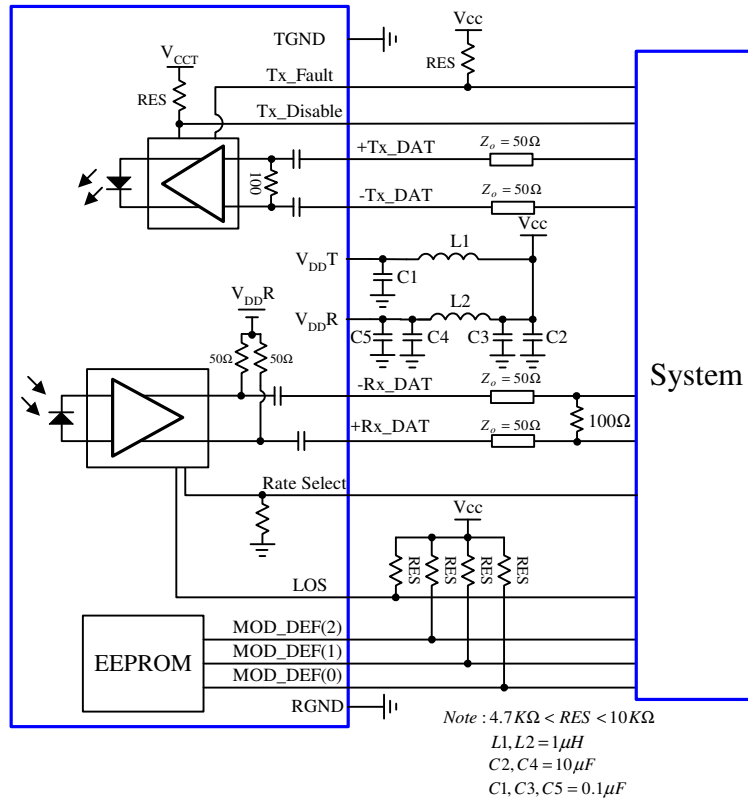


**Figure 1, EEPROM Memory Map Specific Data Field Descriptions**

# 4.25 Gb/s Fibre Channel Single Mode Transceiver

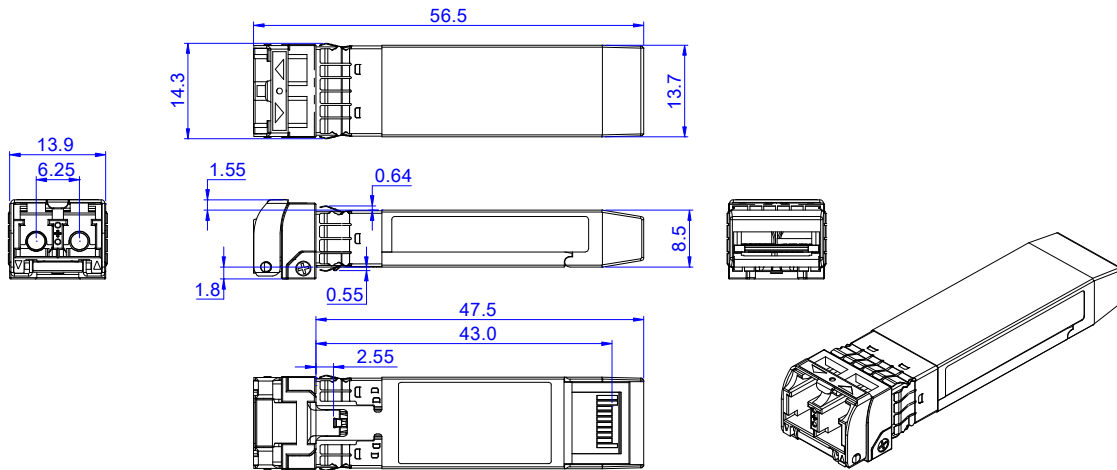


## RECOMMENDED CIRCUIT SCHEMATIC



## MECHANICAL DIMENSIONS

Units in mm



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



## 4.25 Gb/s Fibre Channel Single Mode Transceiver



### REVISION HISTORY

Formulate (Revise) Record		
D/M/Y	Version	Description
11/18/2015	A1	Initial version
02/03/2017	B1	Change housing to Fourté
09/04/2017	B2	Updated firmware version to SFP_4G_LRMR-071317 Updated EEPROM vendor revision to 0001

#### **Claim:**

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