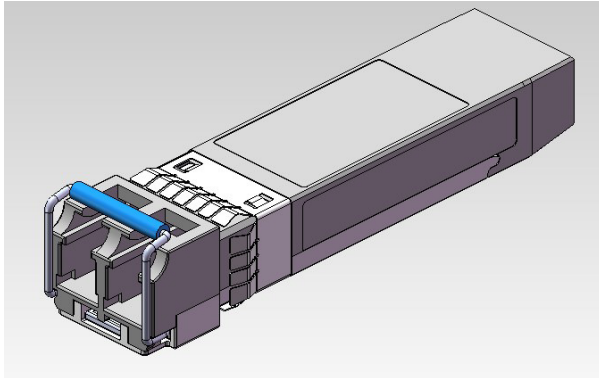
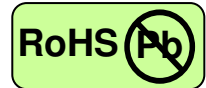


Compact SFP (CSFP) Transceiver



SFP+, 2x Bi-Di, Dual LC Connector, 1270 nm DML for Single Mode Fiber, RoHS Compliant
Digital Diagnostics Functions



Features

- Two Bi-Directional Transceivers in One SFP+ Package
- CSFP MSA Option 2 Compliant
- 1270 nm uncooled DML
- Receiver 1330 nm PIN-TIA
- Data Rate: 11.3 Gb/s, NRZ
- Single +3.3 V Power Supply
- RoHS Compliant and Lead-free
- Compliant to SFP+ Mechanical MSA SFF-8432
- Digital Diagnostic
- Duplex LC Connector
- Compliance with specifications for IEEE-802.3ae 10GBASE-LR/LW at 10.3125 Gb/s

Applications

- 10G Fibre Channel Links
- 10Gigabit Ethernet Links
- 6.144 Gb/s, 3.072 Gb/s, 1.536 Gb/s, 0.768 Gb/s OBASI Links
- 9.830 Gb/s, 7.373 Gb/s, 6.144 Gb/s, 4.915 Gb/s, 2.458 Gb/s, 1.229 Gb/s, 0.614 Gb/s CPRI Links

Description

The Compact Small Form Factor Pluggable (CSFP) optical transceiver CP-A04AEAE-D from Coretek Opto Corp. is the high performance and cost-effective module for serial optical data communication applications specified for data-rates of 10.3125 Gb/s. There are two single fiber duplex transmissions in a standard SFP+ form factor. The module is intended for single mode fiber, operates at a nominal wavelength of Tx: 1270 nm / Rx: 1330 nm and complies with Multi-Source Agreement (MSA) SFP+. It operates with +3.3 V power supply. Each module is integrated digital diagnostics functions via an I²C serial interface.

The module is a duplex LC connector transceiver designed for use in 10 Gigabit Ethernet applications and to provide IEEE-802.3ae compliant link for 10.3 Gb/s intermediate reach applications. The characteristics are performed in accordance with Telcordia Specification GR-468-CORE.

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.

Compact SFP (CSFP) Transceiver



Eye Safety

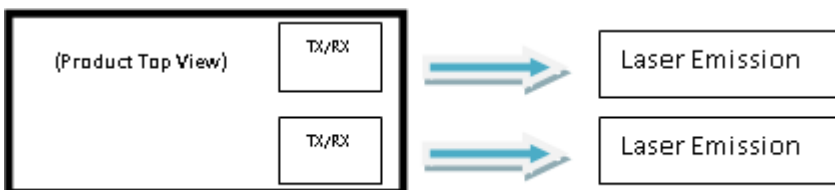
This laser based single mode transceiver is a Class 1 laser product. It complies with IEC 60825-1 Ed.2: 2007 and FDA performance standards for laser products (21 CFR 1040.10 and 1040.11) except for deviations pursuant to Laser Notice 50, dated June 24, 2007.

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	1270 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

Compact SFP (CSFP) Transceiver



Product Information

Model Number	Operating Voltage & SD Output	Distance	Wavelength	Output Power	Sensitivity
CP-A04AEAE-E	3.3 V TTL AC/AC	10 km	Tx:1270 nm Rx:1330 nm	-5 ~ 0 dBm	≤ -14 dBm

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	0		70	°C	
Supply Voltage	V _{CC}	3.14	3.30	3.47	V	
Supply current (Tx+Rx) for each channel	I _{CC}			300	mA	
Total supply current (2 channels)	ICC			600	mA	
Data Rate			10.3125	11.3	Gb/s	

ELECTRICAL CHARACTERISTICS

PARAMETER	SYMBOL	MIN	MAX	UNIT	NOTE
Transmitter					
Data Input Differential Voltage	V _{ID}	120	1200	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	μA	1
Receiver					
Data Output Differential Voltage	V _{OD}		800	mV	2
Rx_LOS Output Voltage - Low	V _{OL}	-0.3	0.4	V	
Rx_LOS Output Current - High	I _{OH}	-50	37.5	μA	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		0	dBm	
Extinction Ratio	ER	3.5			dB	
Center Wavelength	λ _c	1260		1280	nm	
Spectral Width (-20 dB)	Δλ			1	nm	
Side Mode Suppression Ratio	SMSR	30			dB	
Transmitter OFF Power	P _{off}			-30	dBm	
Transmitter Dispersion Penalty	TDP			2	dB	
Relative Intensity Noise	RIN			-128	dB/Hz	

Compact SFP (CSFP) Transceiver



RECEIVER ELECTRO-OPTICAL CHARACTERISTICS

PARAMETER	SYMBOL	MIN	TYP.	MAX	UNIT	NOTE
Maximum Input Optical Power	P_{max}	0.5			dBm	
Receiver Sensitivity	P_{min}			-14	dBm	3
LOS of Signal - Deasserted	P_D			-15	dBm	
LOS of Signal - Asserted	P_A	-30			dBm	
LOS of Signal - Hysteresis	Hys	0.3		5.0	dB	
Reflectance	RL			-12	dB	
Operating Wavelength	λ	1320		1340	nm	

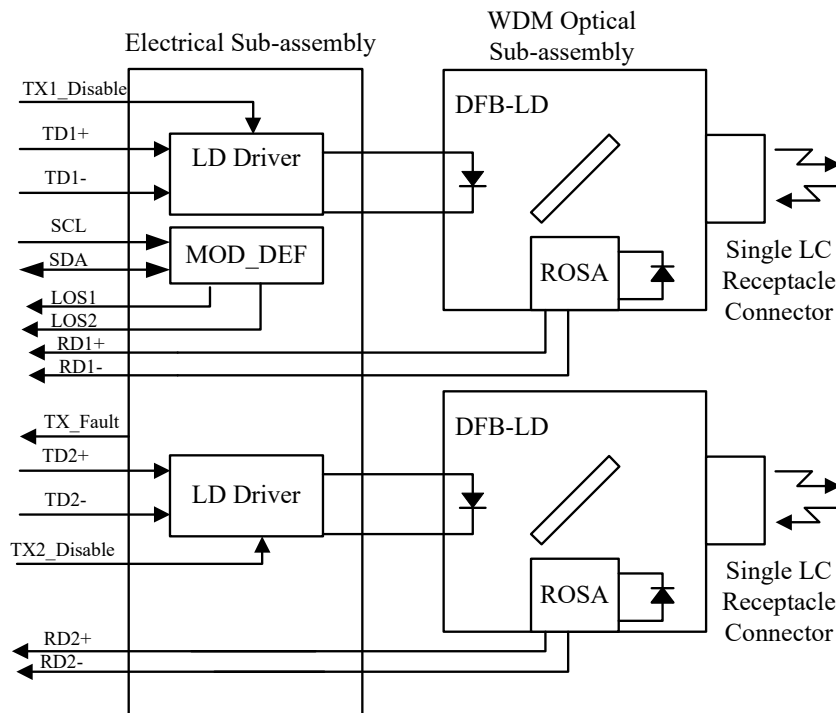
Notes:

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

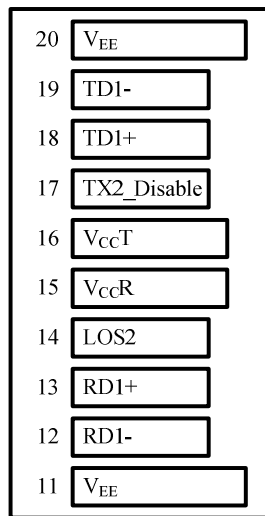
TIMING CHARACTERISTICS

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	

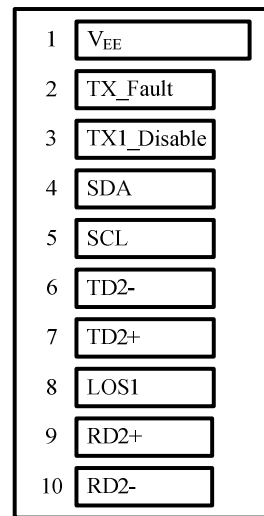
BLOCK DIAGRAM OF TRANSCEIVER



PIN OUT DIAGRAM OF TRANSCEIVER



Top of Board



Bottom of Board (As Viewed through Top of Board)

PIN OUT TABLE

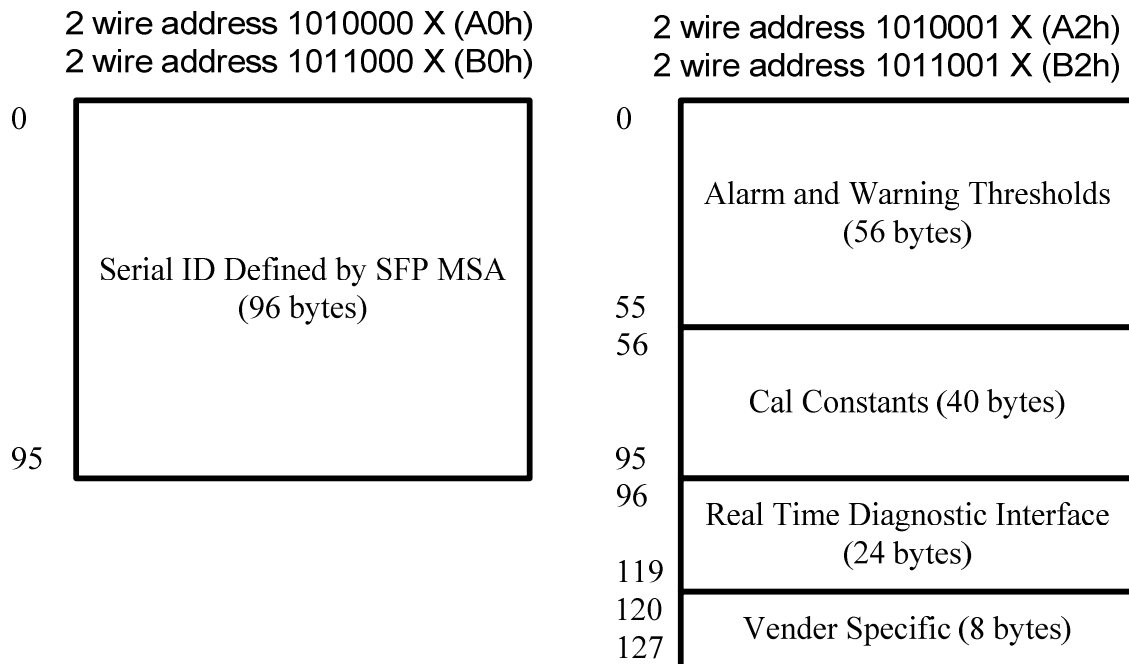
Pin	Symbol	Functional Description
1	V _{EE}	Transceiver ground, common for 2 channels
2	TX_Fault	Transmitter Fault Indication
3	TX_DIS1	Transmitter Disable 1– Module disables on high or open
4	SDA	I ² C data (SDA)
5	SCL	I ² C clock (SCL)
6	TD2-	Inverted transmitter data input of channel 2
7	TD2+	Non-inverted transmitter data input of channel 2
8	LOS1	Loss of Signal in RX channel 1
9	RD2+	Non-Inverted receiver data output of channel 2
10	RD2-	Inverted receiver data output of channel 2
11	V _{EE}	Transceiver ground, common for 2 channels.
12	RD1-	Inverted receiver data output of channel 1
13	RD1+	Non-inverted receiver data output of channel 1
14	LOS2	Loss of Signal in RX channel 2
15	V _{ccR}	Receiver power, common for 2 channels
16	V _{ccT}	Transmitter power, common for 2 channels
17	TX_DIS2	Transmitter Disable 2– Module disables on high or open
18	TD1+	Non-Inverted transmitter data input of channel 2
19	TD1-	Inverted transmitter data input of channel 2
20	V _{EE}	Transceiver ground, common for 2 channels

Compact SFP (CSFP) Transceiver



ENHANCED DIGITAL DIAGNOSTIC INTERFACE

The memory map in the following describes an extension to the memory map. The enhanced interface uses the two wire serial bus address 1010001X (A2h) for channel 1 and 1011001X (B2h) for channel 2 to provide diagnostic information about the module's present operating conditions. The transceiver generates this diagnostic data by digitization of internal analog signals. Calibration and alarm/warning threshold data is written during device manufacture.



Note: A0h, A2h for channel 1 usage and B0h, B2h for channel 2 usage.

Compact SFP (CSFP) 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	00 00 00 40 00 00 00 00	
11	1	Encoding	03	NRZ
12	1	BR, Nominal	67	10.3 Gb/s
13	1	Reserved	00	
14	1	Length (SMF) – km	0A	10 km
15	1	Length (SMF) – 100 m	64	10000 m
16	1	Length (50 μm, OM2)	00	
17	1	Length (62.5 μm, OM1)	00	
18	1	Length (copper)	00	
19	1	Length (50 μm, 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 50 2D 41 30 34 41 45 41 45 2D 44 20 20 20 20	CP-A04AEAE-D
56 ~ 59	4	Vendor Rev	30 30 30 30	0000
60 ~ 61	2	Wavelength	04 F6	1270 nm
62	1	Reserved	00	
63	1	CC BASE	XX	Check sum
64 ~ 65	2	Options	00 12	LOS and TX_DISABLE
66	1	BR max	00	
67	1	BR min	00	
68 ~ 83	16	Vendor SN		
84 ~ 91	8	Date code		
92	1	Diagnostic Monitoring Type	68	
93	1	Enhanced Options	F0	

Compact SFP (CSFP) Transceiver



94	1	SFF-8472	01	
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 FB 00 50 00 5A 00	Alarm_H/L : 100/-5 Warning_H/L : 90/0
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)	31 2D 09 D0 27 10 0C 5A	Alarm_H/L : 1/-6 Warning_H/L : 0/-5
32 ~ 39	8	Rx Power Alarm/Warning (dBm)	31 2D 01 3C 2B D4 01 8E	Alarm_H/L : 1/-15 Warning_H/L : 0.5/-14
40-55	16	Reserved		

Table 3 - Calibration Constants (2 Wire Address A2h)

Address	# Bytes	Name of Field	HEX	Description
56-59	4	Rx_PWR (4)	00 00 00 00	Set to zero for "internally calibrated" devices.
60-63	4	Rx_PWR (3)	00 00 00 00	Set to zero for "internally calibrated" devices.
64-67	4	Rx_PWR (2)	00 00 00 00	Set to zero for "internally calibrated" devices.
68-71	4	Rx_PWR (1)	3F 80 00 00	Set to 1 for "internally calibrated" devices.
72-75	4	Rx_PWR (0)	00 00 00 00	Set to zero for "internally calibrated" devices.
76-77	2	Tx_I (Slope)	01 00	Set to 1 for "internally calibrated" devices.
78-79	2	Tx_I (Offset)	00 00	Set to zero for "internally calibrated" devices.
80-81	2	Tx_PWR (Slope)	01 00	Set to 1 for "internally calibrated" devices.
82-83	2	Tx_PWR (Offset)	00 00	Set to zero for "internally calibrated" devices.
84-85	2	T (Slope)	01 00	Set to 1 for "internally calibrated" devices.
86-87	2	T (Offset)	00 00	Set to zero for "internally calibrated" devices.
88-89	2	V (Slope)	01 00	Set to 1 for "internally calibrated" devices.
90-91	2	V (Offset)	00 00	Set to zero for "internally calibrated" devices.
92-94	3	Reserved	00 00 00	Reserved
95	1	Checksum	XX	Checksum of bytes 0 – 94.

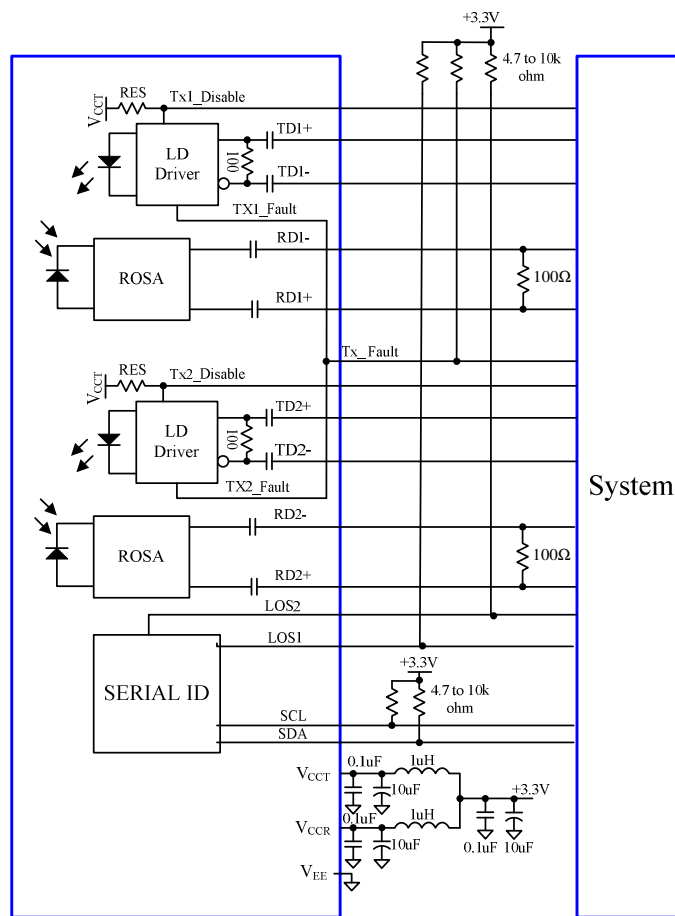
Compact SFP (CSFP) Transceiver



Table 3 - Monitoring Specification

Parameter	Range	Accuracy	Calibration
Temperature	0°C to 70°C	±3°C	Internal
Voltage	3.0 to 3.6 V	±3%	Internal
Bias Current	0 to 80 mA	±10%	Internal
Tx Power	-5 to 0 dBm	±3 dB	Internal
Rx Power	-14 to 1 dBm	±3 dB	Internal

RECOMMENDED CIRCUIT SCHEMATIC

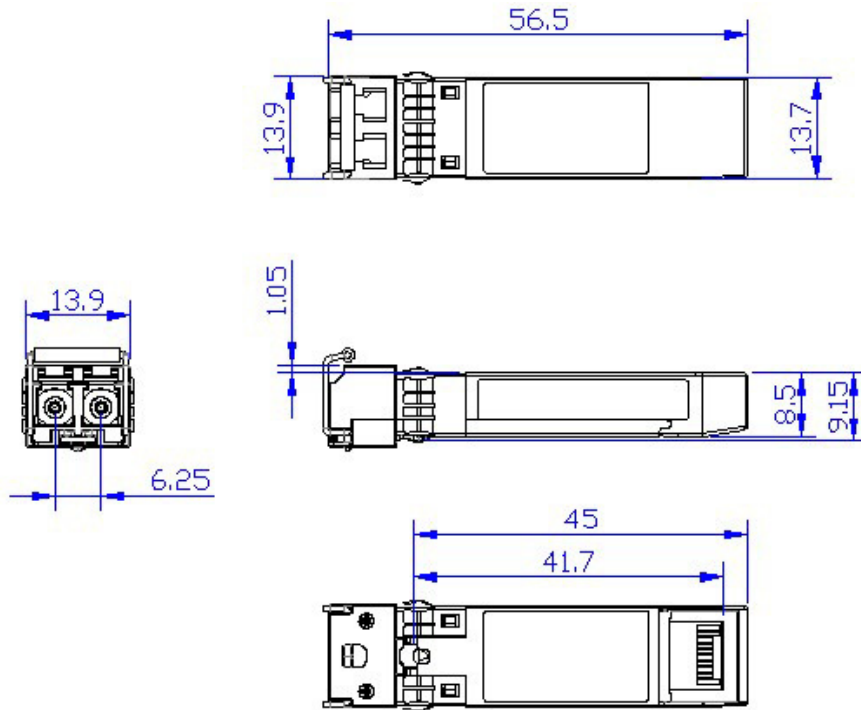


Compact SFP (CSFP) Transceiver



MECHANICAL DIMENSIONS

Units in mm



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

REVISION HISTORY

Formulate (Revise) Record		
D/M/Y	Version	Description
31/05/2017	A	Initial version

Claim:

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