

DATA SHEET

MODULETEK: SFP-OC3-BIDI-T1310/R1550-20KM-C10

155Mb/s SFP Tx1310nm/Rx1550nm Bi-directional Transceiver

SFP-OC3-BIDI-T1310/R1550-20KM-C10 Overview

ModuleTek's SFP-OC3-BIDI-T1310/R1550-20KM-C10 SFP Bi-Directional transceiver is a high performance, cost effective module ,which is Compliant with Specifications for IEEE 802.3. This module are designed for single fiber bidirectional data communication up to 20km. The digital diagnostics functions are available via the 2-wire serial bus, as specified in SFF-8472.

Product Features

- Up to 155Mb/s bi-directional data links
- Hot-pluggable
- Built-in digital diagnostic functions
- 1310nm FP Laser transmitter
- Simplex LC connector
- Up to 20km on 9/125µm SMF
- Single power supply 3.3V
- RoHS Compliant
- Operating case temperature range: 0°C to 70°C

Applications

- Fast Ethernet
- SDH STM-1/ SONET OC-03
- WDM Application

Ordering Information

Part Number	Description	Color on Clasp
SFP-OC3-BIDI-T1310/R1550-20KM-C10	SFP-BIDI, Simplex LC connector, Tx1310nm/Rx1550nm, 20km	Blue
For More Information: ModuleTek Limited Web: www.moduletek.com Email: sales@moduletek.com		

General Specifications

Parameter	Symbol	Min	Typ	Max	Unit	Remarks
Data Rate	DR		155		Mb/s	
Bit Error Rate	BER			10^{-12}		
Operating Temperature	T _C	0		70	°C	1
Storage Temperature	T _{STO}	-40		85	°C	2
Supply Current	I _{CC}			300	mA	3
Input Voltage	V _{CC}	3.14	3.3	3.46	V	
Maximum Voltage	V _{MAX}	-0.5		4	V	3

Notes:

1. Case temperature
2. Ambient temperature
3. For electrical power interface

Optical – Characteristics – Transmitter

$V_{CC}=3.14V$ to $3.46V$, $T_C=0^{\circ}C$ to $70^{\circ}C$

Parameter	Symbol	Min	Typ	Max	Unit	Remarks
Optical Center Wavelength	λ_C	1270	1310	1360	nm	
Spectral Width	$\Delta\lambda$			3	nm	
Output Optical Power	P_{TX}	-14		-8	dBm	1
Extinction Ratio	ER	9.2			dB	
Optical Rise/Fall Time(20%-80%)	t_r/t_f			1300	ps	
Relative Intensity Noise	RIN			-120	dB/Hz	
Eye Mask	Compliant with Eye Mask Defined in IEEE 802.3 standard					

Notes:

1. Class 1 Laser Safety per FDA/CDRH and EN(IEC)60825 regulations.

Optical – Characteristics – Receiver

$V_{CC}=3.14V$ to $3.46V$, $T_C=0^{\circ}C$ to $70^{\circ}C$

Parameter	Symbol	Min	Typ	Max	Unit	Remarks
Optical Center Wavelength	λ_C	1480	1550	1580	nm	
Receiver Sensitivity	R_{X_SEN}			-28	dBm	1
Receiver Overload	P_{OL}	0			dBm	
Receiver Reflectance	TR_{RX}	12			dB	
LOS Assert	LOS_A	-45			dBm	
LOS De-Assert	LOS_D			-34	dBm	
LOS Hysteresis	LOS_H		2	2.5	dB	

Notes:

1. Measured with PRBS $2^{31}-1$ test pattern, $BER < 10^{-12}$

Electrical – Characteristics – Transmitter

$V_{CC}=3.14V$ to $3.46V$, $T_C=0^{\circ}C$ to $70^{\circ}C$

Parameter	Symbol	Min	Typ	Max	Unit	Remarks
Input differential impedance	R_{IN}	90	100	110	Ω	
Single ended data input swing	V_{IN_PP}	200		1200	mV	
Transmit disable voltage	V_D	$V_{CC}-1.3$		V_{CC}	V	
Transmit enable voltage	V_{EN}	V_{EE}		$V_{EE}+0.8$	V	

Electrical – Characteristics – Receiver

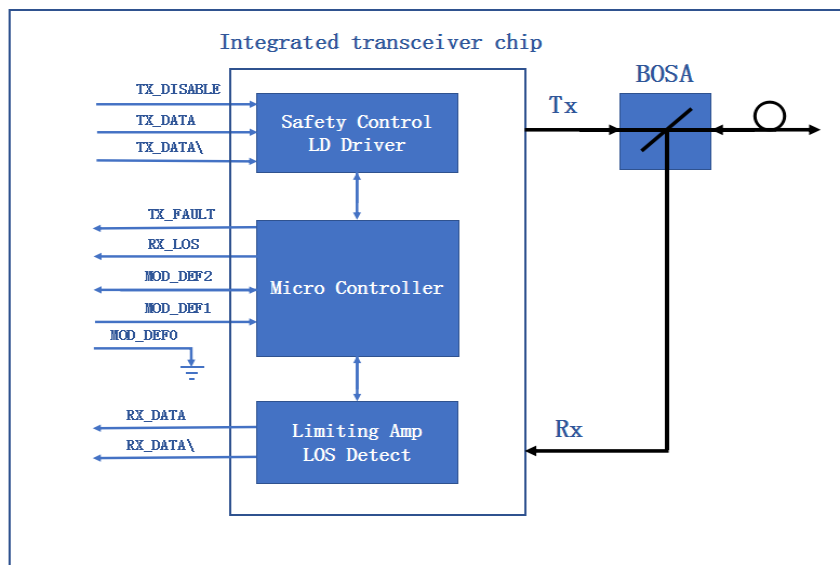
$V_{CC}=3.14V$ to $3.46V$, $T_C=0^{\circ}C$ to $70^{\circ}C$

Parameter	Symbol	Min	Typ	Max	Unit	Remarks
Single ended data output swing	V_{OUT_PP}	300		1000	mV	
Data output rise/fall time(20%-80%)	t_r/t_f			1300	ps	
LOS asserted	V_{LOS_A}	$V_{CC}-0.5$		V_{CC_HOST}	V	
LOS de-asserted	V_{LOS_D}	V_{EE}		$V_{EE}+0.5$	V	

Digital Diagnostic Functions

SFP-OC3-BIDI-T1310/R1550-20KM-C10 supports the 2-wire serial communication protocol as defined in SFF-8472. Digital diagnostic information is accessible over the 2-wire interface at the address 0xA2. Digital diagnostics for SFP-OC3-BIDI-T1310/R1550-20KM-C10 are internally calibrated by default. The internal micro control unit accesses the device operating parameters in real time, Such as transceiver temperature, laser bias current, transmitted optical power, received optical power and transceiver supply voltage. The module implements the alarm function of the SFF-8472, alerts the user when a particular operating parameter exceeds the factory-set normal range.

Block-Diagram-of-Transceiver



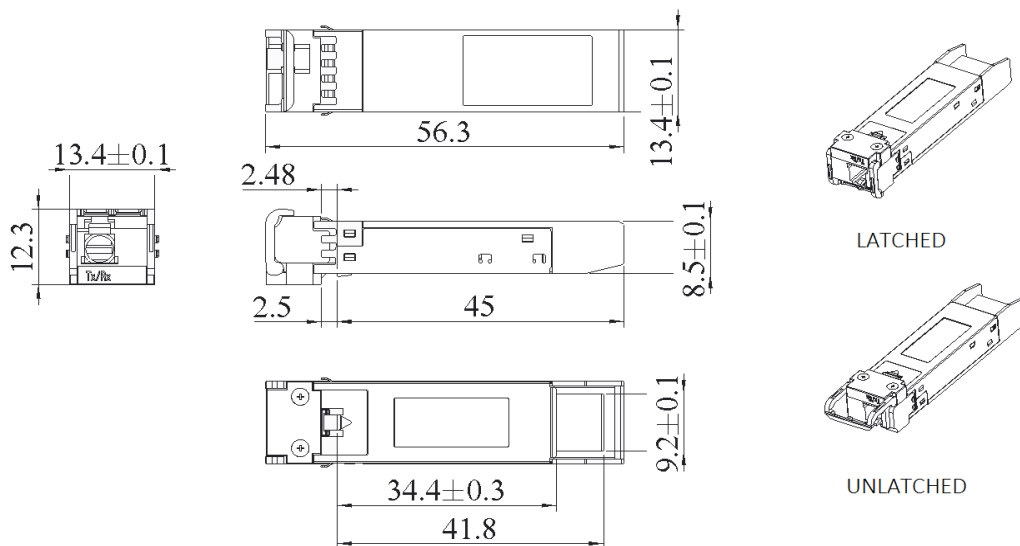
Functions Description

The transmitter is mainly composed of a laser driver part of the intelligent transceiver chip and a light emitting component in a BOSA (Bidirectional Optical Transceiver Assembly). The light-emitting component of BOSA includes a 1310nm FP laser and a backlight photodetection chip. When the module is working, the input signal is connected to the intelligent transceiver chip, at this time, the laser driver of the intelligent transceiver chip supplies the bias current and the modulation current to the laser. The intelligent transceiver chip simultaneously uses an automatic optical power control (APC) feedback loop to maintain a constant average optical power of the laser output. The purpose is to eliminate the change of the output optical signal due to temperature changes and aging of the light source device. When the transmitter enable pin (TX_Disable) is high (TTL logic "1"), the laser output is turned off. When TX_Disable is low (TTL logic "0"), the laser will turn on within 1ms. When the transmitter fault signal (TX_Fault) is reported as high, indicates a transmitter failure caused by the transmitter's bias current or transmitted optical power or laser tube temperature exceeding a preset alarm threshold. Low indicates normal operation.

The receiver is mainly composed of a limiting amplifier part of the intelligent transceiver chip and a light receiving component part in the BOSA. The light receiving components of BOSA includes a PIN photodetector and a transimpedance amplifier chip. When the BOSA detects the incident light signal, it will be converted into a photo-generated current by the PIN photodetector, the photo-generated current is converted into an electrical signal after passing through the transimpedance amplifier. The electrical signal is further amplified by the limiting amplifier of the intelligent transceiver chip, then outputs a fixed-amplitude electrical signal to the host. When the amplitude of the electrical signal received from the incident light conversion of the opposite optical transceiver module is lower than the set threshold, the module reports that the received signal is lost, the RX_LOS pin is high (logic "1"), which can be used to diagnose whether the physical signal is normal. The signal is operated in TTL level. The microprocessor inside the module monitors the module's operating voltage, temperature, transmitted optical power, re-

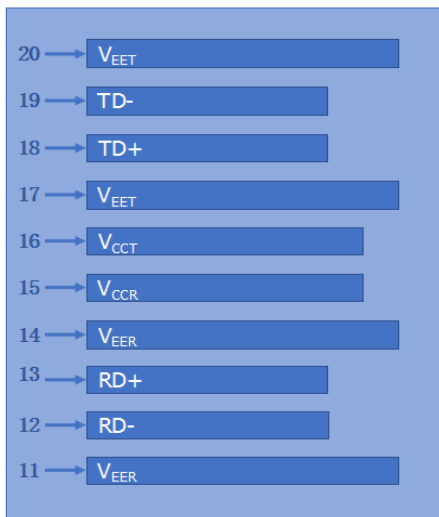
ceived optical power, and laser bias current value in real time. The host acquires this information over a 2-wire serial bus.

Dimensions

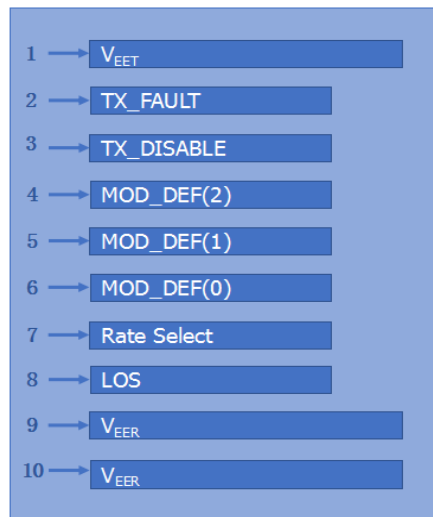


ALL DIMENSIONS ARE ±0.2mm UNLESS OTHERWISE SPECIFIED
UNIT: mm

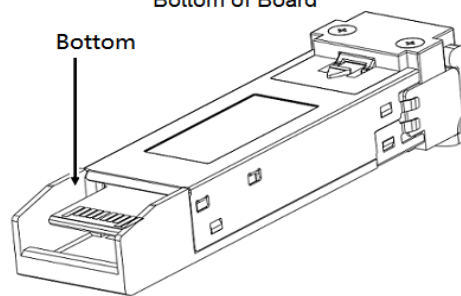
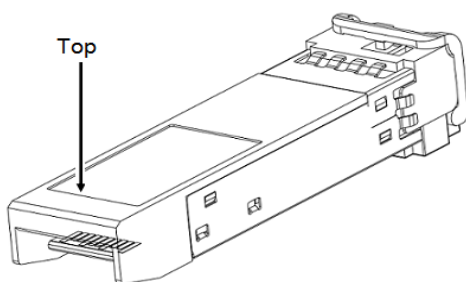
Electrical Pad Layout



Top of Board



Bottom of Board



Pin Assignment

PIN #	Symbol	Description	Remarks
1	V _{EET}	Transmitter ground (common with receiver ground)	1
2	TX_FAULT	Transmitter Fault. Not supported	
3	TX_DISABLE	Transmitter Disable. Laser output disabled on high or open	2
4	MOD_DEF(2)	Module Definition 2. Data line for serial ID	3
5	MOD_DEF(1)	Module Definition 1. Clock line for serial ID	3
6	MOD_DEF(0)	Module Definition 0. Grounded within the module	3
7	Rate Select	No connection required	
8	LOS	Loss of Signal indication. Logic 0 indicates normal operation	4
9	V _{EER}	Receiver ground (common with transmitter ground)	1
10	V _{EER}	Receiver ground (common with transmitter ground)	1
11	V _{EER}	Receiver ground (common with transmitter ground)	1
12	RD-	Receiver Inverted DATA out. AC coupled	
13	RD+	Receiver Non-inverted DATA out. AC coupled	
14	V _{EER}	Receiver ground (common with transmitter ground)	1
15	V _{CCR}	Receiver power supply	
16	V _{CCT}	Transmitter power supply	
17	V _{EET}	Transmitter ground (common with receiver ground)	1
18	TD+	Transmitter Non-Inverted DATA in. AC coupled	
19	TD-	Transmitter Inverted DATA in. AC coupled	
20	V _{EET}	Transmitter ground (common with receiver ground)	1

Notes:

1. Circuit ground is isolated from chassis ground
2. Disabled: T_{DIS} > 2V or open, Enabled: T_{DIS} < 0.8V
3. Should Be pulled up with 4.7k – 10k ohm on host board to a voltage between 2V and 3.6V
4. LOS is open collector output

References

1. IEEE standard 802.3. IEEE Standard Department, 2005.
2. Small Form Factor Pluggable (SFP) Transceiver Multi-Source Agreement (MSA), September 2000.
3. [Digital Diagnostics Monitoring Interface for Optical Transceivers –SFF-8472.](#)