

DATA SHEET

MODULETEK: SFP-SGMII-FE-100BX-D-C10

100M Tx1550nm/Rx1310nm Single fiber bidirectional SFP optical transceiver for SGMII port

SFP-SGMII-FE-100BX-D-C10 Overview

MODULETEK's SFP-SGMII-FE-100BX-D-C10 100Mb/s Single fiber bidirectional optical transceiver is used with Gigabit switches which support SGMII ports. The module has a PHY chip inside and can be used to support FE optical interfaces on gigabit switches. The product implements digital diagnostics via a 2-wire serial interface and is compliant with the SFP Multi-Source Agreement (MSA) standard.

Product Features

- 100Mb/s transmission rate
- Compliant with IEEE 802.3 standard
- Compliant with SFP MSA
- For SGMII ports
- 1550nm FP laser
- Standard bail mechanism for consistent installation and removal
- Built-in digital diagnostic functions
- Hot-Pluggable SFP footprint
- Single LC connector
- Low power consumption (Module work consumption <1W)
- Up to 10km on SMF
- Power supply 3.3V
- RoHS Compliant
- Operating temperature range: 0°C to 70°C

Applications

- 100BASE-BX

Ordering Information

Part Number	Description	Color on Clasp
SFP-SGMII-FE-100BX-D-C10	SGMII 100M SFP bidirectional optical transceiver, Single LC connector, Tx1550nm/Rx1310nm, 10km on SMF	Black
For More Information: ModuleTek Limited Web: www.moduletek.com Email: sales@moduletek.com		

Absolute Maximum Ratings

Parameter	Symbol	Min	Typ	Max	Unit	Remarks
Storage Ambient Temperature	T _S	-40		85	°C	
Supply Voltage	V _{CC}	-0.5		4	V	

General Specifications

Parameter	Symbol	Min	Typ	Max	Unit	Remarks
Data Rate	DR		125		Mb/s	
Bit Error Rate	BER			10 ⁻¹²		
Total Power Consumption	P			1	W	
Supply Current	I _{CC}			300	mA	
Supply Voltage	V _{CC}	3.15	3.3	3.45	V	1
Operating Temperature	T _C	0		70	°C	2

Notes:

1. The voltage required for the module to work normally
2. Case temperature

Link Distances

Data Rate	Fiber Type	Distance Range (km)
125 Mb/s	SMF	10

Optical – Characteristics – Transmitter

$V_{CC}=3.15V$ to $3.45V$, $T_C=0^{\circ}C$ to $70^{\circ}C$

Parameter	Symbol	Min	Typ	Max	Unit	Remarks
Optical Center Wavelength	λ_C	1520	1550	1580	nm	
Output Optical Power	P_{TX}	-14		-8	dBm	1
Extinction Ratio	ER	9	11	15	dB	
Spectral Width	$\Delta\lambda$			2.5	nm	
Relative Intensity Noise	RIN			-120	dB/Hz	
Transmitter Jitter	According to IEEE 802.3 requirement					

Notes:

1. Average

Optical – Characteristics – Receiver

$V_{CC}=3.15V$ to $3.45V$, $T_C=0^{\circ}C$ to $70^{\circ}C$

Parameter	Symbol	Min	Typ	Max	Unit	Remarks
Center Wavelength Range	λ_C	1280	1310	1340	nm	
Receiver Sensitivity	R_{X_SEN}	-28.2		-3	dBm	1
LOS Assert	LOS_A	-40			dBm	
LOS De-Assert	LOS_D			-28.2	dBm	
LOS Hysteresis	LOS_H	0.5		4.5	dB	

Notes:

1. Measured with worst ER: $BER < 10^{-12}$; $2^{31} - 1$ PRBS

Electrical – Characteristics – Transmitter

$V_{CC}=3.15V$ to $3.45V$, $T_C=0^{\circ}C$ to $70^{\circ}C$

Parameter	Symbol	Min	Typ	Max	Unit	Remarks
Input differential impedance	R_{IN}		100		Ω	
Differential data input swing	V_{IN_PP}	250		1200	mV	
Transmit Disable Voltage	V_D	2		V_{CC}	V	
Transmit Enable Voltage	V_{EN}	GND		$GND+0.8$	V	
Transmit Disable Assert Time				10	us	

Electrical – Characteristics – Receiver

$V_{CC}=3.15V$ to $3.45V$, $T_C=0^{\circ}C$ to $70^{\circ}C$

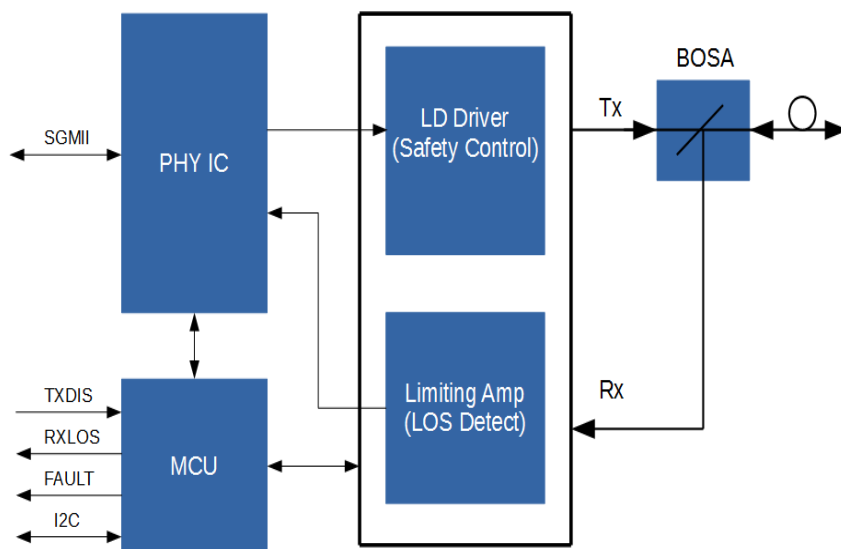
Parameter	Symbol	Min	Typ	Max	Unit	Remarks
Differential data output swing	V_{OUT_PP}	300	500	800	mV	
Data output rise time (20%-80%)	t_r			300	ps	
Data output fall time (20%-80%)	t_f			300	ps	
LOS Fault	V_{LOS_A}	$V_{CC}-0.5$		V_{CC_HOST}	V	
LOS Normal	V_{LOS_D}	GND		$GND+0.5$	V	

Digital Diagnostic Functions

The SFP-SGMII-FE-100BX-D-C10 optical Transceiver has digital diagnostics. The product supports the 2-wire serial communication protocol defined in the SFP MSA and accesses digital diagnostic information via a 2-wire interface at address 0xA2. The digital diagnosis defaults to internal calibration. The micro control unit inside the module can access the module's operating parameters in real time, including operating temperature, bias current, output optical power, received optical power, and operating voltage. The module implements the alarm function of the SFP MSA.

Parameter	Symbol	Accuracy	Units	Report Range		Unit	Remarks
Temperature	Temp	± 3	$^{\circ}C$	-40	95	$^{\circ}C$	Internal Calibration
Voltage	V_{CC}	± 0.1	V	2.7	3.9	V	Internal Calibration
Bias Current	I_{bias}	± 10	%	0	80	mA	Internal Calibration
Tx Power	P_{TX}	± 3	dB	-16	-6	dBm	Internal Calibration
Rx Power	P_{RX}	± 3	dB	-30.2	-1	dBm	Internal Calibration

Block-Diagram-of-Transceiver



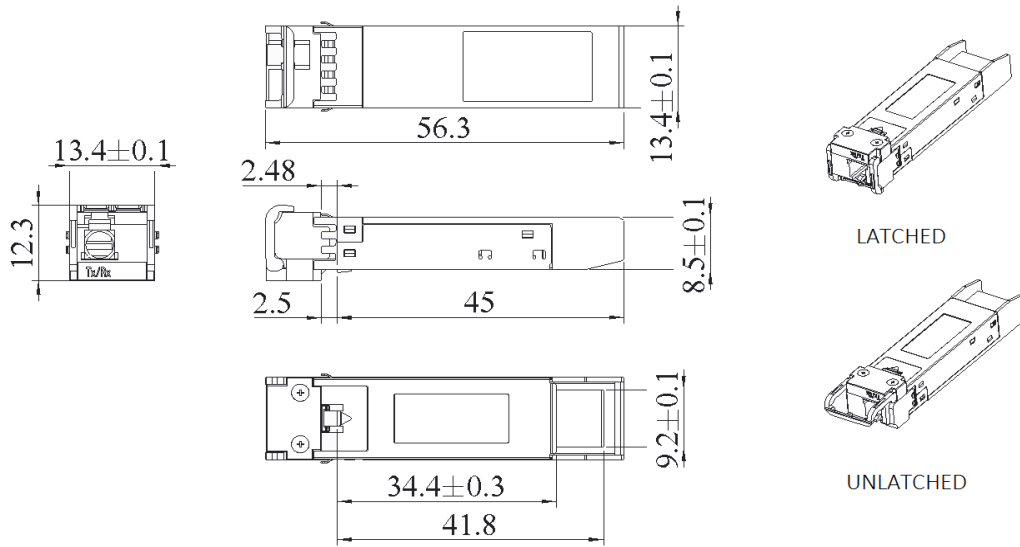
Functions Description

SFP-SGMII-FE-100BX-D-C10 is a single-fiber bidirectional 100M optical module that can be used in Gigabit switches. The module integrates a PHY chip that supports the SGMII interface. The module is interconnected to the host's Gigabit interface via the SGMII interface. Through the SGMII protocol, an optical interface conforming to the 100BX standard is provided externally. The product meets SFP specifications and supports digital diagnostics to help Gigabit switch ports interconnect with 100M legacy optical interface devices.

The transmitting end of the module consists of a laser driver and a light emitting component part of the BOSA (Bidirectional Optical Transceiver Module). The light emitting component part of the BOSA includes a FP laser with a wavelength of 1550 nm and a backlight detection chip. The module includes an LC port, and the optical path is filtered and separated by a wavelength division multiplexing (WDM) splitter integrated in the module to complete the emission of the 1550nm optical signal and the reception of the 1310nm optical signal. The module always works with the SFP-SGMII-FE-100BX-U-C10 module on the opposite end. When the module is working, the PHY chip output signal is sent to the laser driver section. At this time, the laser driver supplies the bias current and the modulation current to the laser. The laser driver simultaneously uses an automatic optical power control (APC) feedback loop to maintain a constant average optical power of the laser output.

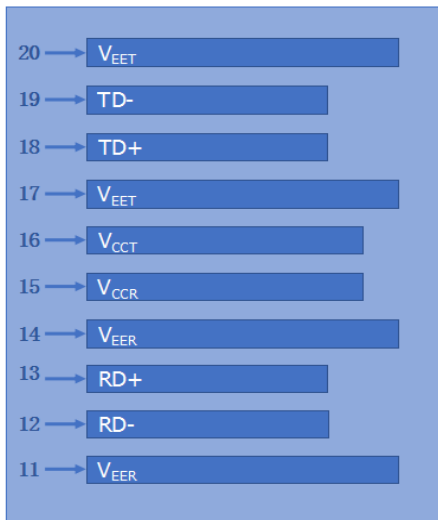
The receiving end of the module consists of a light receiving component in the BOSA and a limiting amplifier. The PIN of the light receiving component of the BOSA operates at a wavelength of 1310 nm. When the BOSA detects the incident light signal, the PIN converts the optical signal into a photo-generated current. The photo-generated current is amplified by a TIA (transimpedance amplifier) and converted into an electrical signal. The electrical signal is further amplified by a limiting amplifier to output a fixed-amplitude electrical signal to the PHY chip.

Dimensions

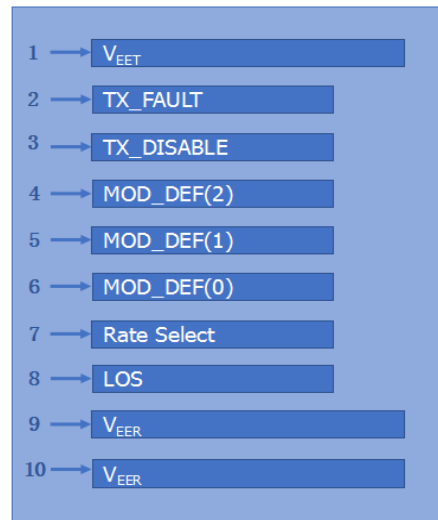


ALL DIMENSIONS ARE ±0.2mm UNLESS OTHERWISE SPECIFIED
UNIT: mm

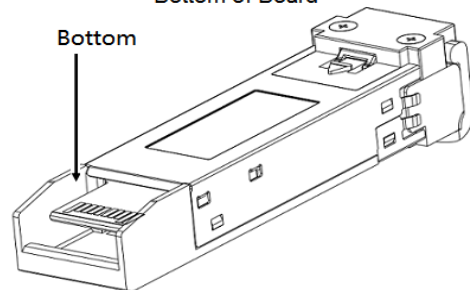
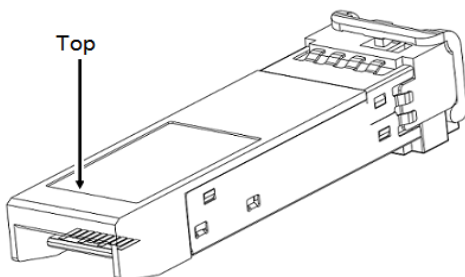
Electrical Pad Layout



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. SGMII interface	
13	RD ₊	Receiver Non-inverted DATA out. AC coupled. SGMII interface	
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. SGMII interface	
19	TD ₋	Transmitter Inverted DATA in. AC coupled. SGMII interface	
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.](#)
2. [Small Form Factor Pluggable \(SFP\) Transceiver Multi-Source Agreement \(MSA\), INF-8074i.](#)
3. [Digital Diagnostics Monitoring Interface for Optical Transceivers –SFF-8472.](#)
4. [Serial-GMII Specification.](#)