

10Gbps 1550nm 40km duplex SFP+ Transceiver BN-S10G-ER40-1550



Features

- Up to 11.3Gbps data rate
- 1550nm Cooled EML Laser and PIN photo detector
- Duplex LC receptacle optical interface compliant
- Single +3.3V power supply
- DDMI function available with internally calibrated mode
- Hot-pluggable
- Receiver loss of signal output
- Transmitter disable input
- International Class1 laser safety certified
- Operating temperature range:
 - Commercial: -5°C~70°C
 - Industrial: -40°C~85°C
- RoHS Compliant

Application

- 10G BASE-ER/EW
- 10G Fiber Channel

Standard

- Compliant with SFP+ MSA
- Compliant with SFF-8472
- Compliant with IEEE802.3ae
- 10G FC

Ordering Information

Part Number	Specifications					
	Package	Data Rate (Gbps)	Wavelength (nm)	Temperature (°C)	Reach (km)	With/ Without CDR
GTS-L1596-40DC	SFP+	10.3125	1550	-5~70	40	Without CDR
GTS-L1596-40DI	SFP+	10.3125	1550	-40~85	40	Without CDR

Specification

Absolute Maximum Ratings				
Parameter	Symbol	Min	Max	Unit
Storage temperature	TS	-40	85	°C
Power Supply Voltage	V _{CC}	0	3.6	V
Relative Humidity	RH	5	95	%

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Recommended Operating Conditions						
Parameter	Symbol	Min	Typical	Max	Unit	Notes
Operating Case Temperature	T_C	-5		70	°C	GTS-L1596-40DC
		-40		85		GTS-L1596-40DI
Power Supply Voltage	V_{CC}	3.13	3.3	3.47	V	
Data Rate		1	10.3125	11.3	Gbps	
Fiber Length 9/125µm core SMF				40	km	

Electrical Characteristics						
Parameter	Symbol	Min	Typical	Max	Unit	Notes
Total Supply Current	I_{CC}			300	mA	
Transmitter						
Transmitter Differential Input Voltage		180		1200	mV	
Tx_Fault Output Voltage - High	V_{OH}	2.4		V_{CC}	V	LVTTL
Tx_Fault Output Voltage - Low	V_{OL}	0		0.4	V	LVTTL
Tx_Disable Input Voltage - High	V_{IH}	2		V_{CC}	V	LVTTL
Tx_Disable Input Voltage - Low	V_{IL}	0		0.8	V	LVTTL
Input Differential Impedance		90	100	110	Ω	
Receiver						
Receiver Differential Output Voltage		300		850	mV	
LOS Output Voltage - High	V_{OH}	2.4		V_{CC}	V	LVTTL
LOS Output Voltage - Low	V_{OL}	0		0.4	V	LVTTL
Output Differential Impedance		90	100	110	Ω	

Optical Transmitter Characteristics						
Parameter	Symbol	Min	Typical	Max	Unit	Notes
Average Output Power	P_{OUT}	-1		+3	dBm	
Center Wavelength	λ_c	1530	1550	1565	nm	
Spectral Width(-20dB)	$\Delta\lambda$			1	nm	
Side Mode Suppression Ratio	SMSR	30			dB	
Extinction Ratio	ER	8.2			dB	
Relative Intensity Noise	RIN			-128	dB/Hz	
Optical Rise/Fall Time	T_R/T_F	28		50	ps	
Transmitter and Dispersion Penalty	TDP			2	dB	
Transmitter OFF Power	P_{OFF}			-30	dBm	
Output Eye Diagram	Complies with IEEE802.3ae					

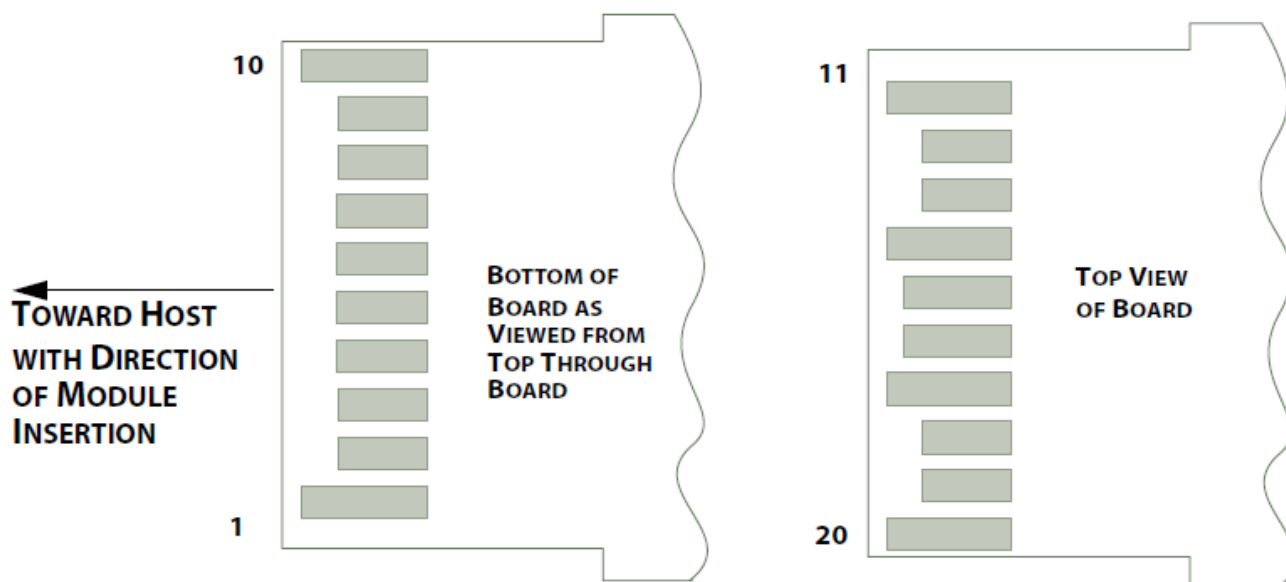
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Extinction Ratio	ER	8.2			dB	
Relative Intensity Noise	RIN			-128	dB/Hz	
Optical Rise/Fall Time	T_R/T_F	28		50	ps	
Optical Receiver Characteristics						
Parameter	Symbol	Min	Typical	Max	Unit	Notes
Center Wavelength	λ_c	1260		1610	nm	
Receiver Sensitivity	P_{SEN}			-16	dBm	1
Input Saturation Power (Overload)	P_{SAT}	0.5			dBm	
Receiver Reflectance				-12	dB	
LOS De-assert Level	LOSD			-17	dBm	
LOS Assert Level	LOSA	-30			dBm	
LOS hysteresis	HYS	0.5		6	dB	

Note 1. Measured with PRBS2³¹⁻¹ pattern, @10.3125Gbps, ER=8.2dB, BER=1x10⁻¹².

Pin Definition

The SFP+ modules are hot-pluggable. Hot pluggable refers to plugging in or unplugging a module while the host board is powered. The SFP+ host connector is a 0.8 mm pitch 20 position right angle improved connector specified by SFF-8431, or stacked connector with equivalent with equivalent electrical performance. Host PCB contact definitions are given in table below. SFP+ module contacts mates with the host in the order of ground, power, followed by signal as illustrated by figure below and the contact sequence order listed in the table.



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Pin No	Symbol	Name/Description	Power Seq.	Notes
1	VeeT	Transmitter Ground (Common with Receiver Ground)	1st	1
2	TX_Fault	Transmitter Fault, Low: normal; High: abnormal	3rd	2
3	TX_Disable	Transmitter Disable High: Transmitter off Low: Transmitter on	3rd	3
4	SDA	2-Wire Serial Interface Data Line (Same as MOD-DEF2 in INF-8074i)	3rd	4
5	SCL	2-Wire Serial Interface Clock Line (Same as MOD-DEF2 in INF-8074i)	3rd	4
6	Mod_ABS	Module Absent, Connect to VeeT or VeeR in Module	3rd	5
7	RS0	Rate Select 0, optionally controls SFP+ module receiver. NC	3rd	6
8	RX_LOS	Receiver Loss of Signal indication High: loss of signal Low: signal detected	3rd	7
9	RS1	Rate Select 1, optionally controls SFP+ module transmitter. NC	3rd	8
10	VeeR	Receiver Ground	1st	1
11	VeeR	Receiver Ground	1st	1
12	RD-	Receiver Inverted DATA out. AC Coupled. CML-O	3rd	
13	RD+	Receiver Non-inverted DATA out. AC Coupled. CML-O	3rd	
14	VeeR	Receiver Ground	1st	1
15	VccR	Receiver Power Supply	2nd	
16	VccT	Transmitter Power Supply	2nd	
17	VeeT	Transmitter Ground	1st	1
18	TD+	Transmitter Non-Inverted DATA in. AC Coupled. CML-I	3rd	
19	TD-	Transmitter Inverted DATA in. AC Coupled. CML-I	3rd	
20	VeeT	Transmitter Ground	1st	1

Power Seq.: Pin engagement sequence during hot plugging.

Note 1. The module signal ground contacts.

Note 2. Tx_Fault is an open drain/collector and should be pulled up to Vcc on the host with a 4.7k - 10kΩ resistor.

Note 3. Tx_Disable is pulled up to VccT with a 4.7k - 10kΩ resistor inside the module.

Note 4. SDA&SCL (I2C) shall be pulled up with 4.7k - 10kΩ resistors on host board.

Note 5. Mod_ABS is connected to VeeT or VeeR inside the module.

Note 6. RS0 optionally controls SFP+ module receiver, is pulled low to VeeR with > 30kΩ resistor in the module.

High: RX input signaling rate > 4.25Gbps,

Low: RX input signaling rate ≤ 4.25Gbps.

Note 7. RX_LOS is loss of signal indication, shall be pulled up 4.7k - 10kΩ resistor on host board.

Note 8. RS1 optionally controls SFP+ module transmitter, is pulled low to VeeT with > 30kΩ resistor in the module.

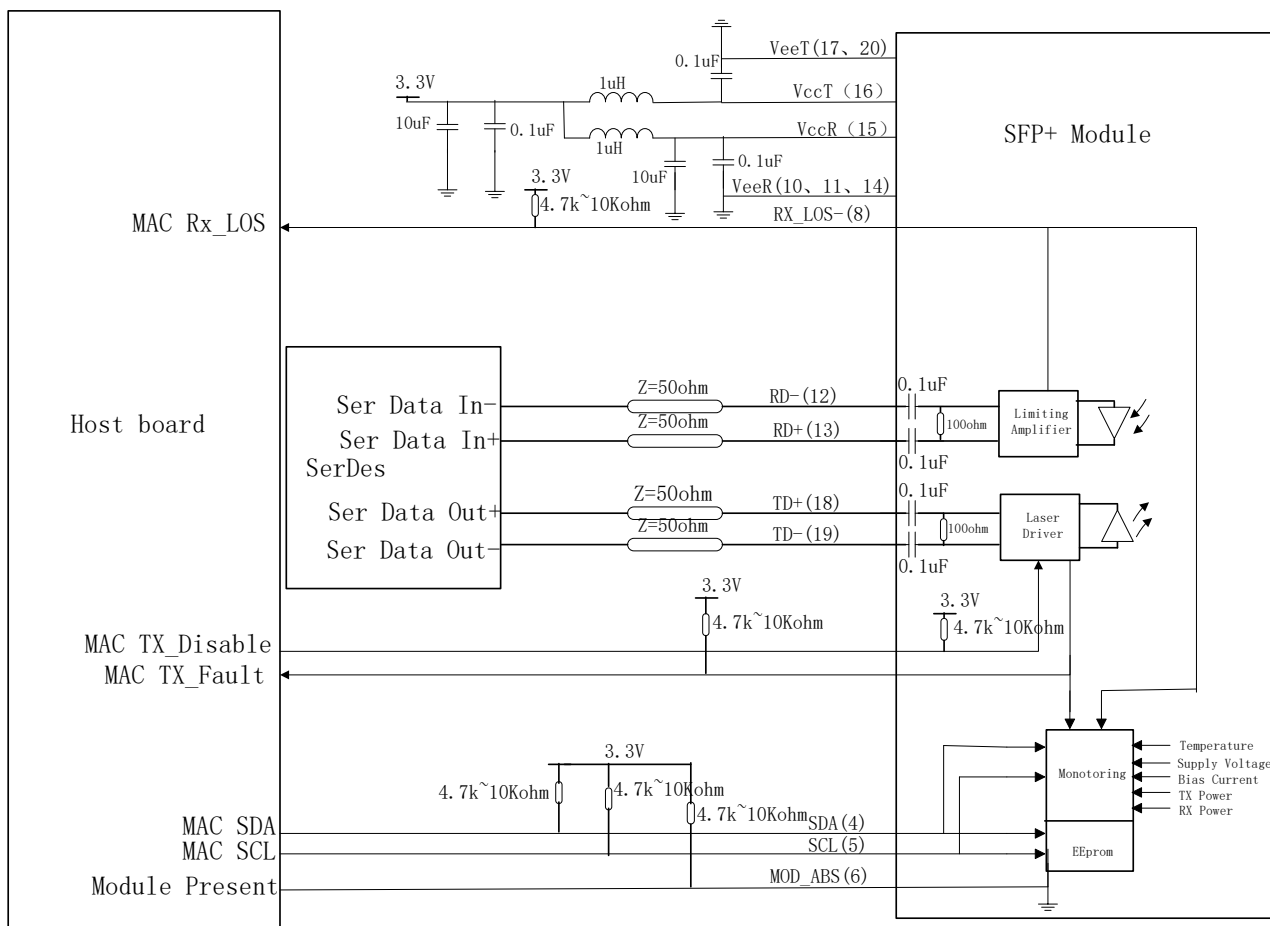
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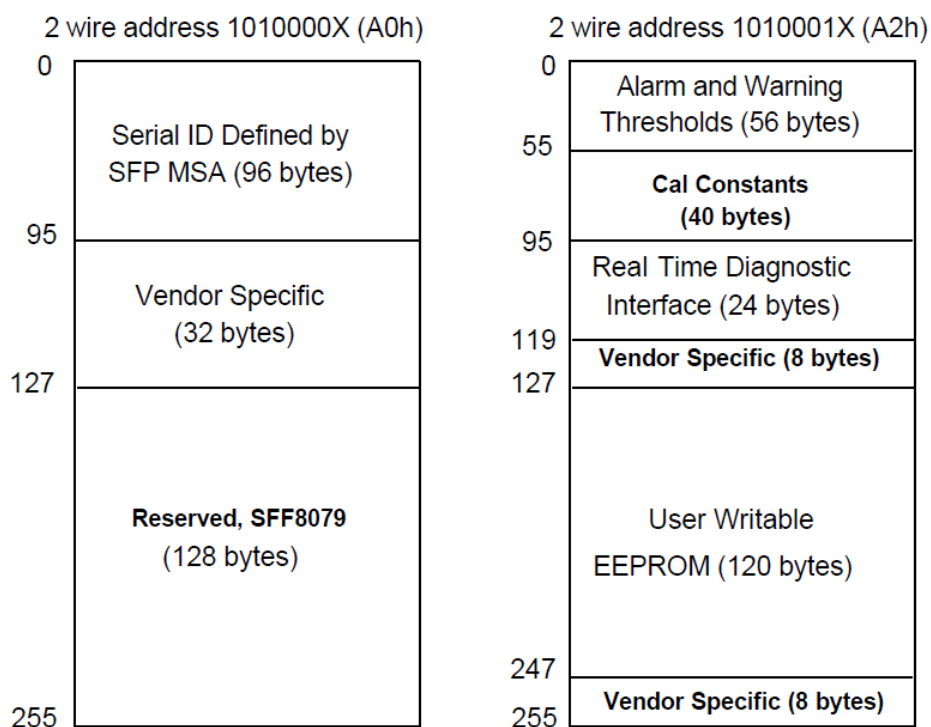
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Typical Application Circuit



Digital Diagnostic Memory Map



EEPROM Serial ID Memory Contents

The optical transceiver contains an EEPROM. It provides access to sophisticated identification information that describes the transceiver's capabilities, standard interfaces, manufacturer, and other information. When the serial protocol is activated, the host generates the serial clock signal (SCL, Mod Def 1). The positive edge clocks data into those segments of the EEPROM that are not writing protected within the SFP transceiver. The negative edge clocks data from the SFP transceiver. The serial data signal (SDA, Mod Def 2) is bi-directional for serial data transfer. The host uses SDA in conjunction with SCL to mark the start and end of serial protocol activation. The memories are organized as a series of 8-bit data words that can be addressed individually or sequentially.

The Module provides diagnostic information about the 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. Received power monitoring, transmitted power monitoring, bias current monitoring, supply voltage monitoring and temperature monitoring all are implemented. The diagnostic data are raw A/D values and must be converted to real world units using calibration constants stored in EEPROM locations 56 - 95 at wire serial bus address A2h. The digital diagnostic memory map specific data fields define as following.

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Package Outline

Dimensions are in millimeters. All dimensions are ± 0.1 mm unless otherwise specified. (Unit: mm)

