10G SFP+ Transceiver

10.3Gbps SFP+ Optical Transceiver with DDM, Single-Mode, 1310 nm, Duplex LC, 10Km

Model: SFP-SM13TG-10C / SFP-SM13TG-10I

PRODUCT OVERVIEW

The SFP+ transceivers are high-performance, cost-effective modules that support a data rate of 10 Gbps and transmission distances of up to 10 km over single-mode fiber (SMF). Each transceiver consists of three main components: a DFB laser transmitter, a PIN photodiode integrated with a transimpedance amplifier (TIA), and an MCU control unit. All modules comply with Class I laser safety requirements.

These transceivers are compatible with the SFP Multi-Source Agreement (MSA) and support SFF-8472 digital diagnostic functions.

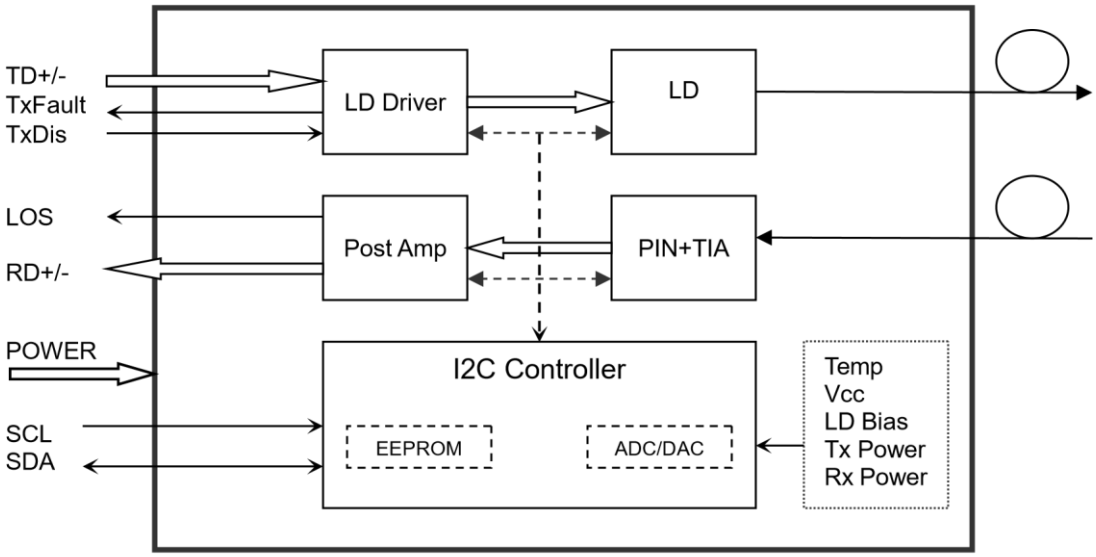
FEATURES

- Supports bit rates up to 10.7 Gbps
- Hot-pluggable SFP+ footprint
- 1310 nm DFB laser and PIN photodiode; supports transmission up to 10 km over SMF
- Compliant with SFP+ MSA and SFF-8472; features duplex LC receptacle
- RoHS compliant
- Single +3.3V power supply
- Real-time digital diagnostic monitoring
- Operating case temperature:
    - Commercial: 0°C to 70°C
    - Industrial: -40°C to +85°C

APPLICATIONS

- 10 Gbps optical systems
- 10GBASE-LR at 10.3125 Gbps
- 10GBASE-LW at 9.953 Gbps
- Other optical links

SPECIFICATIONS



Transceiver functional diagram

Absolute Maximum Ratings

Parameter	Symbol	Min	Max	Unit
Supply Voltage	Vcc	-0.5	4.5	V
Storage Temperature	Ts	-40	+85	°C
Operating Humidity	-	5	85	%

Recommended Operating Environment

Parameter		Symbol	Min	Typical	Max	Unit
Operating Case Temperature	Commercial	Tc	0		+70	°C
	Industrial		-40		+85	
Power Supply Voltage		Vcc	3.135	3.30	3.465	V
Power Supply Current		Icc			350	mA
Data Rate			1.0	10.3	10.7	Gbps

Optical and Electrical Characteristics

Parameter		Symbol	Min	Typical	Max	Unit	Note
Transmitter							
Centre Wavelength		λc	1270	1310	1350	nm	
Spectral Width (-20dB)		Δλ			1	nm	
Side-Mode Suppression Ratio		SMSR	30	-		dB	
Average Output Power		Pout	-6.5		-0.5	dBm	1
Extinction Ratio		ER	3.5			dB	
Data Input Swing Differential		VIN	180		850	mV	2
Input Differential Impedance		ZIN	90	100	110	Ω	
TX Disable	Disable		2.0		Vcc	V	
	Enable		0		0.8	V	
TX Fault	Fault		2.0		Vcc	V	
	Normal		0		0.8	V	
Receiver							
Centre Wavelength		λc	1260		1600	nm	
Receiver Sensitivity					-14.4	dBm	3
Receiver Overload			0.5			dBm	3
LOS De-Assert		LOS_D			-15.5	dBm	
LOS Assert		LOS_A	-30			dBm	
LOS Hysteresis			0.5			dB	
Data Output Swing Differential		Vout	300		900	mV	4
LOS		High	2.0		Vcc	V	
		Low			0.8	V	

Note:

1. The optical power is launched into SMF.
2. PECL input, internally AC-coupled and terminated.
3. Measured with a PRBS 2^{31}-1 test pattern @10312Mbps, BER ≤1×10^{-12}.
4. Internally AC-coupled.

Timing and Electrical

Parameter	Symbol	Min	Typical	Max	Unit
Tx Disable Negate Time	t_on			1	ms
Tx Disable Assert Time	t_off			10	μs
Time To Initialize, including Reset of Tx Fault	t_init			300	ms
Tx Fault Assert Time	t_fault			100	μs
Tx Disable To Reset	t_reset	10			μs
LOS Assert Time	t_loss_on			100	μs
LOS De-assert Time	t_loss_off			100	μs
Serial ID Clock Rate	f_serial_clock		100	400	KHz
MOD_DEF (0:2)-High	V_H	2		Vcc	V
MOD_DEF (0:2)-Low	V_L			0.8	V

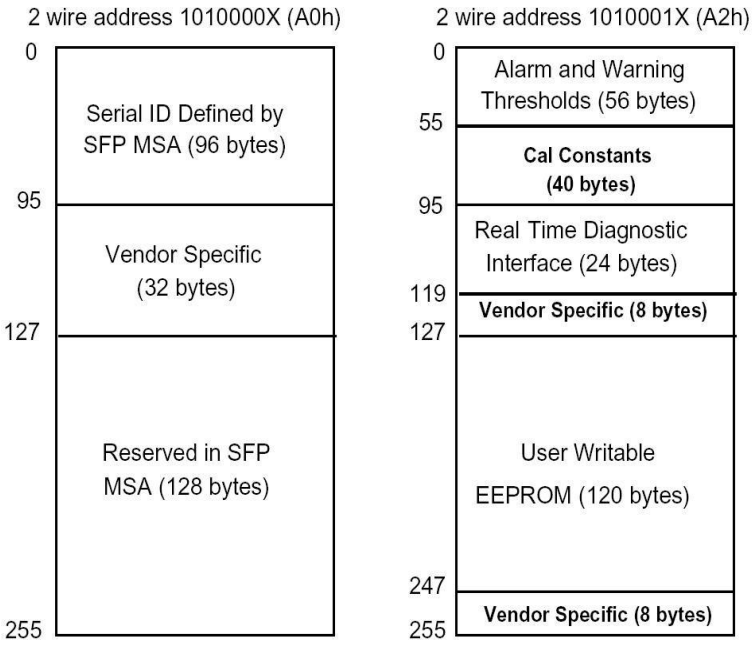
Diagnostic

Parameter	Range	Unit	Accuracy	Calibration
Temperature	0 to +70	°C	±3°C	Internal
	-40 to +85			
Voltage	3.0 to 3.6	V	±3%	Internal
Bias Current	0 to 100	mA	±10%	Internal
TX Power	-6.5 to -0.5	dBm	±3dB	Internal
RX Power	-20 to -1	dBm	±3dB	Internal

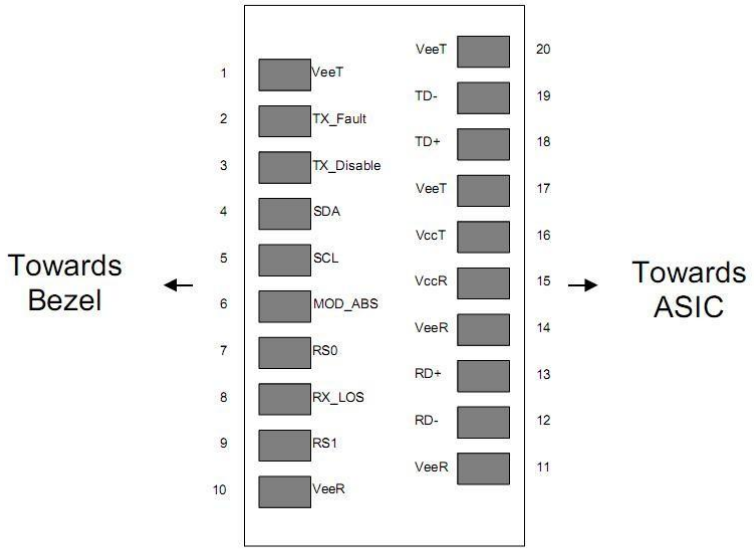
Digital Diagnostic Memory Map

The transceivers provide serial ID memory contents and diagnostic information about current operating conditions via the 2-wire serial interface (SCL, SDA). The diagnostic features — whether internally or externally calibrated — include received power monitoring, transmitted power monitoring, bias current monitoring, supply voltage monitoring and temperature monitoring.

The digital diagnostic memory map defines the specific data fields as follows.



Pin Descriptions



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Pin	Signal Name	Description	Plug Seq.	Note
1	VEET	Transmitter Ground	1	
2	TX FAULT	Transmitter Fault Indication	3	1
3	TX DISABLE	Transmitter Disable	3	2
4	SDA	SDA Serial Data Signal	3	
5	SCL	SCL Serial Clock Signal	3	
6	MOD_ABS	Module Absent. Grounded within the module	3	
7	RS0	Not Connected	3	
8	LOS	Loss of Signal	3	3
9	RS1	Not Connected	3	
10	VEER	Receiver Ground	1	
11	VEER	Receiver Ground	1	
12	RD-	Inv. Received Data Out	3	4
13	RD+	Received Data Out	3	4
14	VEER	Receiver Ground	1	
15	VCCR	Receiver Power Supply	2	
16	VCCT	Transmitter Power Supply	2	
17	VEET	Transmitter Ground	1	
18	TD+	Transmit Data In	3	5
19	TD-	Inv. Transmit Data In	3	5
20	VEET	Transmitter Ground	1	

Note:

Plug Seq.: Pin engagement sequence during hot plugging.

1. TX Fault is an open collector output, which should be pulled up with a 4.7k~10kΩ resistor on the host board to a voltage between 2.0V and Vcc+0.3V. Logic 0 indicates normal operation; Logic 1 indicates a laser fault of some kind. In the low state, the output will be pulled to less than 0.8V.

2. Laser output disabled on TDIS >2.0V or open, enabled on TDIS <0.8V.

3. LOS is open collector output. Should be pulled up with 4.7k~10kΩ on host board to a voltage between 2.0V and 3.6V. Logic 0 indicates normal operation; logic 1 indicates loss of signal.

4. RD-/+: These are the differential receiver outputs. They are internally AC-coupled 100 differential lines which should be terminated with 100Ω (differential) at the user SERDES.

5. TD-/+: These are the differential transmitter inputs. They are internally AC-coupled, differential lines with 100Ω differential termination inside the module.

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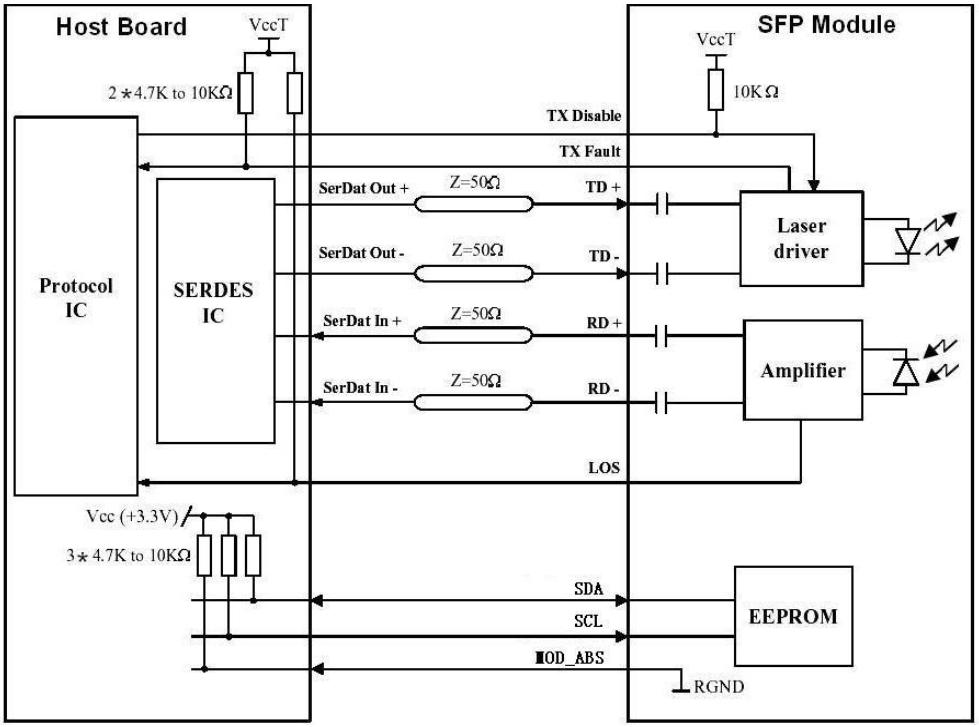
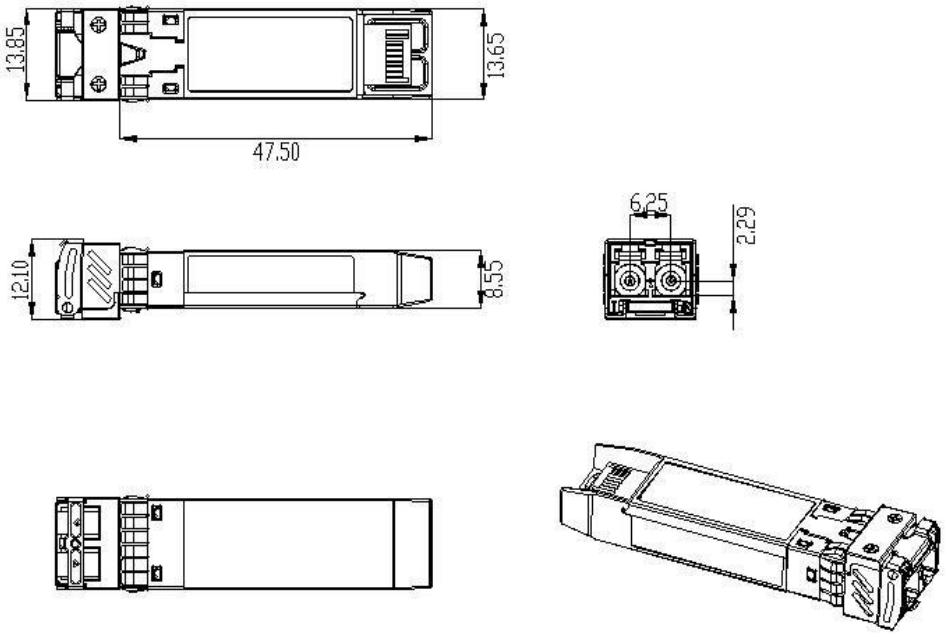
RECOMMENDED INTERFACE CIRCUIT



MECHANICAL DIMENSIONS



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PACKAGE CONTENTS

- 1 × 10.3Gbps SFP+ Transceiver

WARRANTY

- Standard 1-Year Limited Warranty, unless otherwise specified by Sales.
- Optional Advance Replacement Warranty is available upon request

ORDERING INFORMATION

Part Number	Descriptions
SFP-SM13TG-10C	10.3Gbps SFP+ Transceiver with DDM, Single-Mode, 1310nm, Duplex LC, 10Km, Temperature 0°C ~ +70°C.
SFP-SM13TG-10I	10.3Gbps Industrial SFP+ Transceiver with DDM, Single-Mode, 1310nm, Duplex LC, 10Km, Temperature -40°C ~ +85°C.

CONTACT INFORMATION

For more information, please visit our website or contact our customer service team:

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- **Email:** sales.apac@dsgio.com

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